AUGUST, 1956

American Engineer

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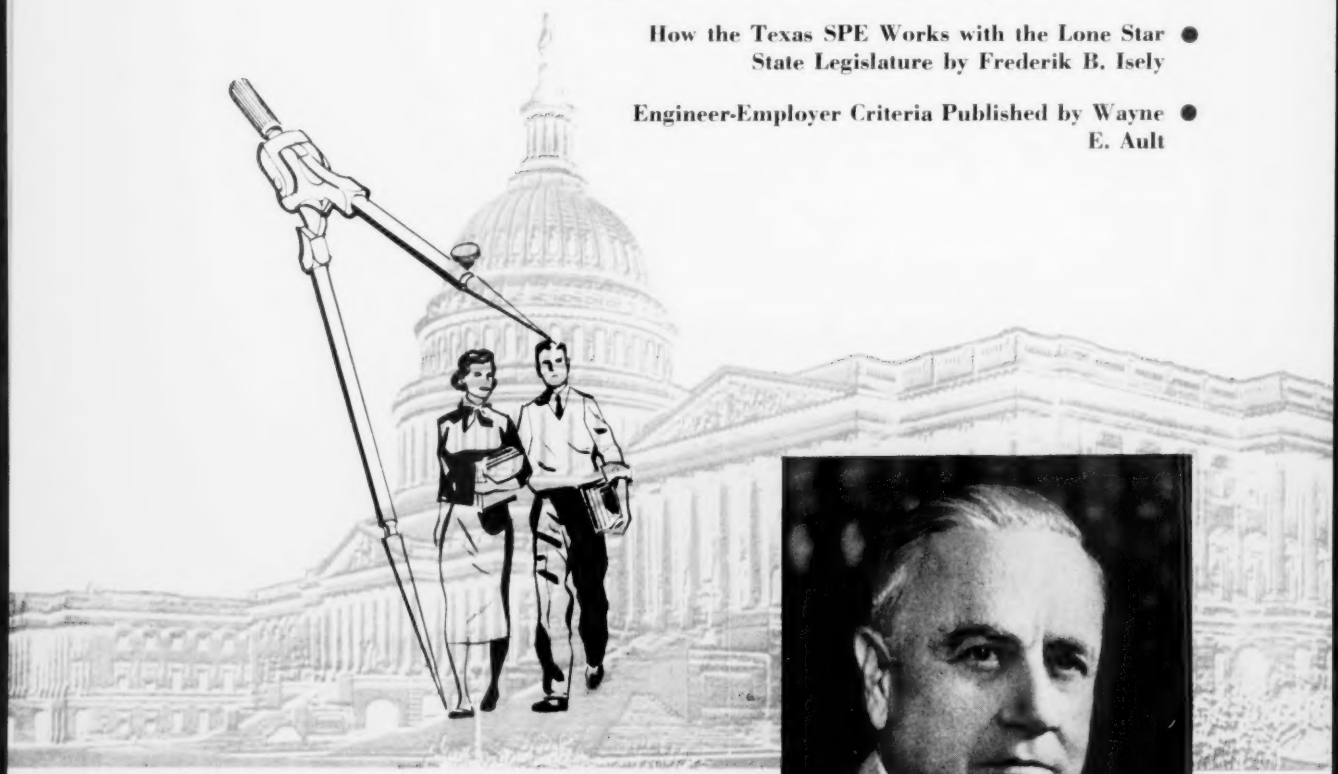

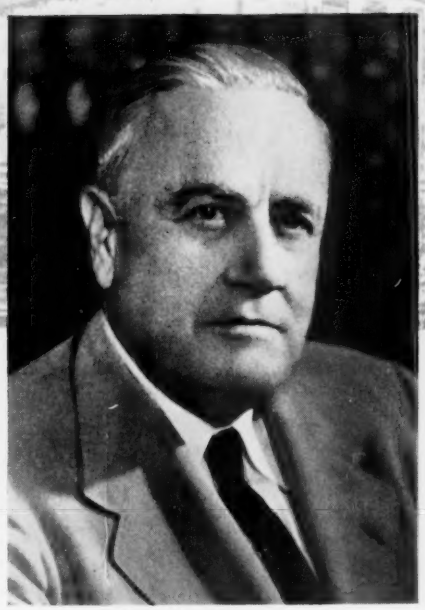

Senator Wiley, right, examines the implications of the current engineering manpower situation in terms of protecting America's interests at home and abroad.

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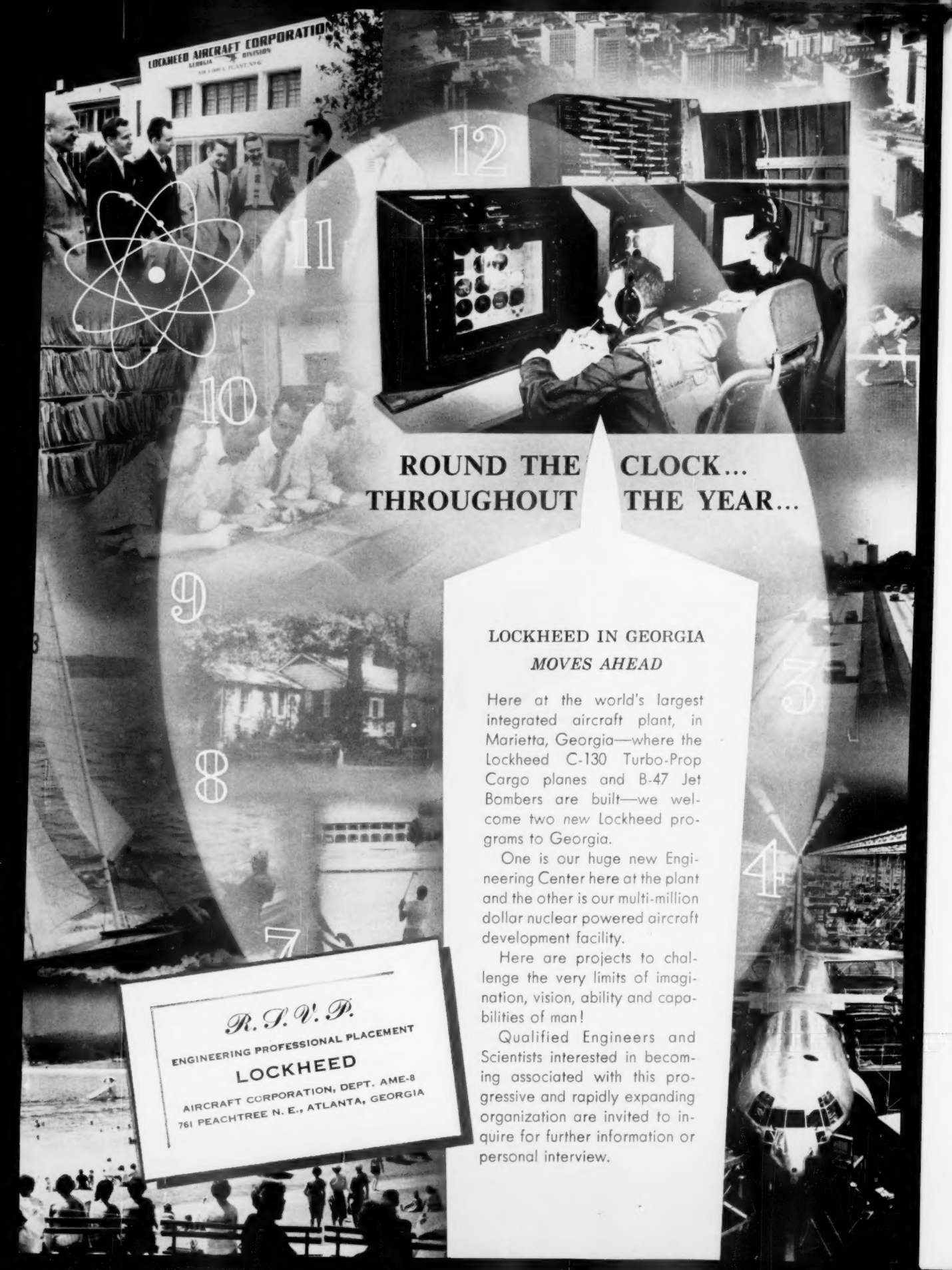

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Letters to the Editor

Automation and Engineers . . .

Dear Editor:

. . . Progress is an inherent fundamental of engineering. The need for new materials, tools, processes and equipment is the constant spur to advancement in our profession.

And now, in this atomic age, we come to automation and automation has come to engineering for the tools to make it possible. What will we do about it? We'll deliver, of course—we always have produced the tools and equipment required for our advancing civilization and for its defense. . . .

We've accomplished all of this but while we've been about it we have generally neglected to consider the sociological, economic or spiritual effects of our engineering operations on the world and our fellowmen.

Automation through engineering — the very words conjure up visions of marvelous equipment designed and produced by engineers to do the work, yes, even the thinking for man and for mankind.

What engineer, gifted with any spark of imagination, does not thrill when he thinks of the possible developments to come from our advancing knowledge in this direction.

But what about the problems we are creating for people as we progress to new heights in technological development? What will we do to aid our fellowmen to adjust wisely their modes of living, their industrial, commercial and governmental procedures, and their educational processes so as to enjoy the greatest possible benefit from automation, to adjust themselves to the terrific impact of this new knowledge?

We cannot escape our responsibility. It is no longer possible for us to think that we as technical specialists have only to discharge the duties of our intricate and specialized jobs and that we are free to ignore any impact of our work on the political, economic, social or religious phases of life around us.

Automation through engineering—what is engineering? One widely used definition recites that engineering is "the art and science by which the properties of matter and the sources of power in nature are made useful to man." It follows then that if Automation is to come through engineering that it must be built on those things which are basic in nature and it must be designed to be useful to mankind.

As we create automatic controls to simplify the duties of the housewife and make it possible for her to have more time away from home; as we create new gadgets to reduce the hours of effort in an office so that the boss and all of his help can have more time for an afternoon game of golf; as we design new machines and equipment and processes for the shops, the factories, the great chemical plants, and for the use of farmers in the production of food, we must be extremely careful that we do not destroy the dignity and value of labor in the eyes of our people and become a nation of robots satisfied to have machines attempt to think for us, feed us, care for us and fight for our freedoms.

We must not permit automation to make our way of life so easy that lack of incentive will contribute to a general disintegration of the moral fiber which has made us a great nation. . . .

As we meet the challenge of this new development we must be careful lest we allow our enthusiasm for speedy progress to make us forget the importance and dignity of man. We read stories about electronic calculators credited with mathematical solutions in moments as compared to lengthy years required by man to reach the same result. Automatic controls so sensitive, so fast and so accurate that they defy the finite thinking of mere mortals.

Science and the engineer have created these marvels. They perform tasks beyond the ability of man; but none of these creations can reason, none can operate without initial action on the part of man, none of them are exempt from the basic laws of nature.

As we move ahead with science we must ever be mindful that God created man in his own image and gave him dominion over the earth. At the time of creation, in the very beginning, man was naked like all creatures; but man alone of all living things had power to reason. Only man was capable of designing a wheel or of using a lever to move a weight.

The mental processes of man are controlled by his brain—a center of Automation the like of which man will never create. It functions without the benefit of printed circuits, electronic tubes or transistors. It is part of man, created by God and not an inanimate particle of matter.

Science is a product of man's brain and man's brain is a product of God's creation. Science and religion no more conflict with each other than light does with electricity.

We must not permit the wondrous results of man-developed Automation to cloud our vision so that we will wander into worship of graven images with push-button controls. Render unto Caesar the things that are Caesar's; but do not permit your awe of a Univac to become the worship of false gods or false ideals. *Automation through engineering*—yes, but God forbid that we lose our identity, our individuality, or our dignity because of automatic thinking, or because automation has been allowed to destroy the initiative and imagination of mankind.

J. B. Dannenbaum, P. E.,
Houston, Tex.

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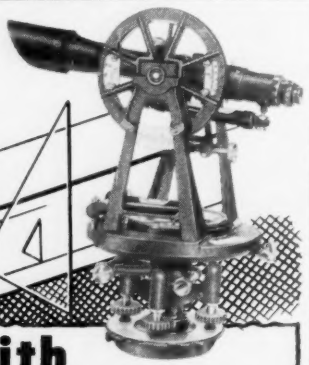

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Society States Views In Letter to Congress

Members of Congress were recently sent a letter by Harry G. Kennedy, chairman of NSPE's Legislative Committee, stating the views of the National Society in regard to the legislation proposing Federal development of the Hells Canyon Dam.

Attached to the letter was a statement of policy adopted by NSPE in June, 1952, favoring the use of private enterprise in the development of our natural resources.

Asking that Congress not pass the Federal development bill, Mr. Kennedy pointed out that natural resources are "particularly important to the engineering profession, because it is that profession . . . which plays a vital role in the development of natural resources for the benefit of all the people consistent with sound economic and governmental policy."

Col. Michael J. Blew Joins NSPE Staff

Col. Michael J. Blew, USAR, Ret., has joined the staff of NSPE as field representative handling liaison with affiliate state societies and local chapters.

He was formerly chief of the sanitation branch in the Office of the Chief of Engineers in Washington, D. C. Before his retirement from active duty in military service in 1947, he served as chief sanitary engineer in the Office of the Surgeon, Headquarters, 4th Service Command, Atlanta, Ga.

A chemical engineering graduate of Indiana University, Col. Blew did graduate work and taught at Yale University, and is a registered professional engineer in Pennsylvania. He served as a field engineer for the U. S. Public Health Service, and was an instructor in municipal sanitation at the Drexel Institute in Philadelphia. For many years he was engineer in charge of research for the City and County of Philadelphia, where he supervised experimental work to develop sewage treatment plants for the area.

Col. Blew has long been active in NSPE work, and was one of the founders of the Georgia SPE. As field representative for the National Society he will concentrate on the extension of membership programs, and chapter and state society activities.

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PROFESSIONAL NEWS IN CAPSULE FORM

A Roundup of Late Events for Professional Engineers

Coover Elected AIEE President for 1956-57

The election of Mervin S. Coover, associate dean of engineering and professor of electrical engineering at Iowa State College, as 1956-57 president of the American Institute of Electrical Engineers was announced at the recent AIEE annual meeting. Mr. Coover is an NSPE member.

Also elected were six vice presidents, three directors and a treasurer.

The new vice presidents are: Donald E. Garr, General Engineering Laboratory, General Electric Company, Schenectady, N.Y.; Leland F. Stone, Apparatus Sales Office, General Electric Company, Newark, N.J.; J. H. Foote, president, Commonwealth Associates, Inc., Jackson, Mich.; Norman F. Rode, professor of electrical engineering, Texas Agricultural and Mechanical College, College Station, Tex.; Mansfield M. Ewell, Engineering & Service Department, Westinghouse Electric Corporation, Portland, Ore., and Henry H. Kerr, vice president in charge of operations, Toledo Edison Company, Toledo, Ohio.

Messrs. Garr, Stone, Foote and Kerr are NSPE members.

The new directors are: William R. Brownlee, Southern Services, Inc., Birmingham, Ala.; Alva A. Johnson, Switchgear Division, Westinghouse Electric Corporation, Pittsburgh, Pa., and L. M. Robertson, chief electrical engineer, Public Service Company of Colorado, Denver, Colo. Walter J. Barrett, New Jersey Bell Telephone Company, Newark, N.J., was re-elected treasurer.

Messrs. Robertson and Barrett are members of NSPE.

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Georgia Tech Appoints New Architect Director

Paul M. Heffernan, professor of architectural design, has been appointed director of the school of architecture at the Georgia Institute of Technology, it has been announced.

"Watch the frantic scurrying around when I open the door. I'm not expected back for another day!"

Fellowship Awards By Science Foundation

Applications will be accepted through September 4, 1956, for the second group of senior postdoctoral fellowships to be awarded by the National Science Foundation during the current calendar year, Alan T. Waterman, NSF director, has announced.

Fellowships will be awarded in mathematical, physical, medical, biological, engineering and other sciences. Names of successful fellowship candidates will be announced on October 16, 1956.

To be eligible for these awards, candidates must be citizens of the United States with demonstrated ability and special aptitude for advanced training and productive scholarship in the sciences. In addition, candidates must have at least five years experience beyond the science doctorate or its equivalent.

Applications and further details may be obtained from the Division of Scientific Personnel and Education, National Science Foundation, Washington 25, D.C.

General Electric Gives Six-Week Fellowships

More than 250 science and mathematics secondary school and college teachers are studying this summer under the expanded fellowship program which the General Electric Company is sponsoring in cooperation with five leading colleges.

Schools participating in the program include Union College, Schenectady, N.Y.; Case Institute of Technology, Cleveland, Ohio; Rensselaer Polytechnic Institute, Troy, N.Y.; Purdue University, Lafayette, Indiana, and Syracuse University, Syracuse, N.Y.

The six-week expense-free fellowships have been given to teachers from thirty-eight states by General Electric as part of its extensive series of programs of assistance to

education. Faculties of the five colleges conduct the courses which are designed to bring teachers up-to-date in their fields of instruction.

In addition to underwriting the expenses, General Electric places some of its personnel and facilities at the disposal of the colleges. Company engineers, scientists and executives are called upon to talk in their special fields.

New ARBA Directory Released For 1956

The 1956 edition of the directory of *Highway Officials and Engineers*, published by the American Road Builders' Association, is available for distribution.

The pocket-sized handbook contains the following information:

More than 1,500 names, titles and addresses of administrative engineers and officials in the 48 state highway departments and the District of Columbia.

Administrative personnel of the Bureau of Public Roads, including the heads of its division offices.

Engineers and administrative personnel of toll road authorities.

Officers and directors of ARBA, its seven organized divisions, and its Washington headquarters staff.

A tabulation by states showing highway funds expended during 1955 as well as an estimate of expenditures for highway construction and maintenance during 1956.

A report on states having legislative authority to construct toll roads.

The publication is available for $1 per copy from American Road Builders' Association, 600 World Center Building, Washington 6, D. C.

Dr. Milton Thompson Elected ASME Fellow

Dr. Milton J. Thompson, a member of NSPE, was recently elected to the rank of Fellow in the American Society of Mechanical Engineers.

Dr. Thompson, professor and chairman, aeronautical engineering department, The University of Texas in Austin, has made noteworthy contributions to the engineering profession. He is the author of eighteen technical papers, some of which were published abroad.

R. A. Haber Named Chief Engineer in Delaware

Richard A. Haber has been assigned the combined duties of chief engineer of the Delaware State Highway Department and the Delaware Inter-state Highways Division, a toll-road agency.

Mr. Haber, a member of NSPE, had formerly served as chief engineer of the department, but for the past two and a half years he has been associated with Michael Baker, Jr., Inc., Rochester, Pa.

Publication By Carroll Is Book Club Selection

A book by Phil Carroll, a member of NSPE, entitled *How Foremen Can Control Costs*, made the July selection of the McGraw Business Book Club.

In the "For Industrial Management" section, Mr. Carroll's book is described as having been written expressly for the foreman, whatever his title—group leader, chief engineer, sales manager, or whatever.

Top books in their field are selected for the membership by the Club.

Fulbright Scholarship Applications Now Open

Attention is called to the fact that Fulbright scholarships for graduate study abroad are open to professional persons not now engaged in college or university study. Any U. S. citizen with a bachelor's degree is eligible for these foreign study awards. Applicants must be at the pre-doctoral level and normally under the age of 35.

November 1, 1956, is the dealine for submitting applications for the 1957-58 academic year. Requests for application forms must be postmarked by October 25. Application blanks and a brochure describing the Fulbright program are available at the Institute of International Education, 1 East 67th Street, New York City, and at the Institute's regional offices in Chicago, Denver, Houston, San Francisco and Washington.

Wisconsin Summer Workshop — September 15-17, 1956, Nippersink Manor, Genoa City, Wisconsin.

Virginia Society of Professional Engineers—Annual Meeting, October 18-20, 1956, The Chamberlain Hotel, Old Point Comfort, Va.

NSPE Fall Meeting — October 25-26, 1956, The Greenbrier, White Sulphur Springs, W. Va.

West Virginia Society of Professional Engineers—Annual Meeting, October 25-26, 1956, The Greenbrier, White Sulphur Springs, W. Va.

North Dakota Society of Professional Engineers—Annual Meeting, November 2-3, 1956, Grand Forks, N. D.

Puerto Rico Society of Professional Engineers—Annual Meeting, November 24, 1956, Puerto Rico Institute of Engineers Building, San Juan, Puerto Rico.

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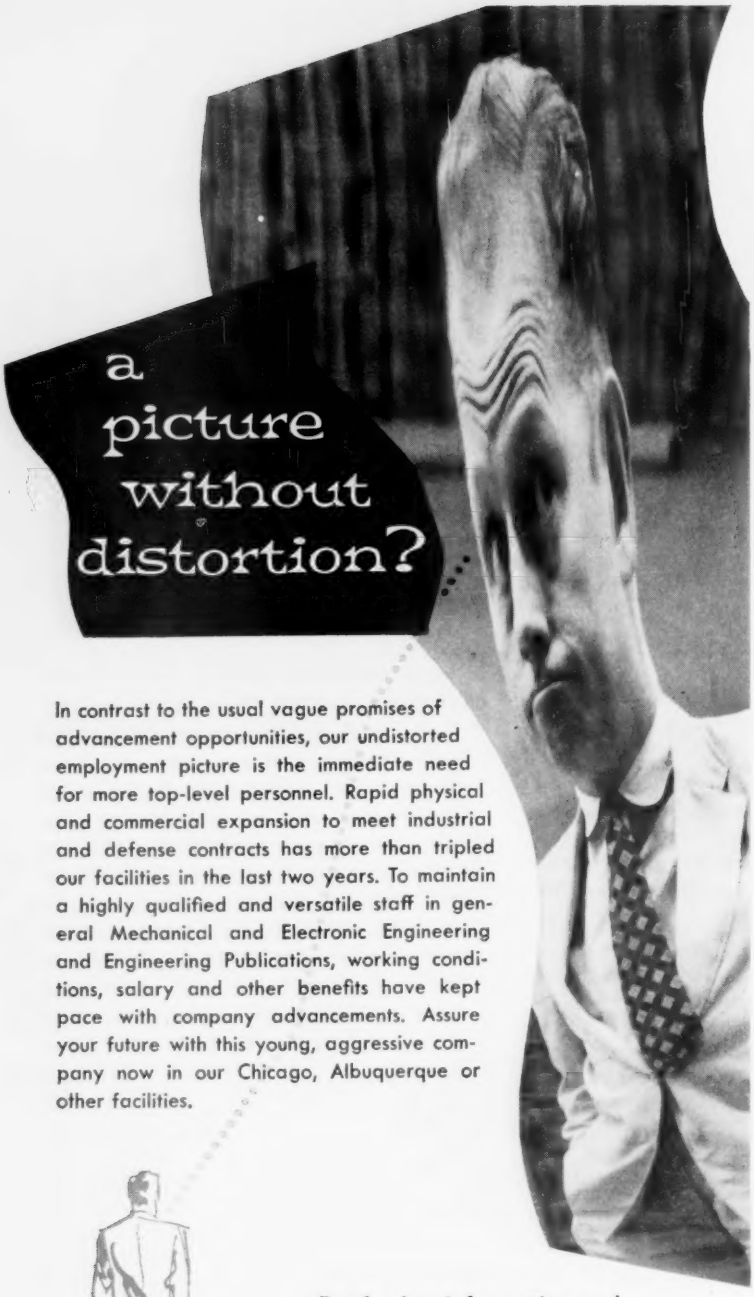
Van Zelst Presents Course in Colombia

Theodore W. Van Zelst, president of Soiltest, Inc., of Chicago, recently presented a two-day course in field and laboratory testing to seventy-five Colombian engineers in conjunction with the opening of the new Ministry of Public Works Laboratory in Bogota, Columbia. He is an NSPE member.



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"Drexel Key Award" Presented To Knight

Alan T. Knight, a member of NSPE and executive vice president of Catalytic Construction Company of Philadelphia, has received the "Drexel Key Award," presented annually by the Alumni Association of the evening college of Drexel Institue of Technology to an outstanding alumnus in recognition of distinguished educational service and professional achievement.

Mr. Knight, a structural engineering graduate in the class of 1930, was cited at the recent annual dinner of the Association.

Ryan To Be Installed As ASME Head in Nov.

A past vice president of NSPE, William F. Ryan, will be installed as the 1956-57 president of the American Society of Mechanical Engineers at their annual meeting in November after a letter ballot of the members.

Mr. Ryan is vice president, director and senior consulting engineer of Stone & Webster Engineering Corporation, Boston.

Manhattan College Enrolls Engineers

The Manhattan College School of Engineering announced recently that it has accepted 518 of the 975 students who applied for admission to the college next fall.

High scholastic standards account for the more than four hundred rejections. Applicants must have an excellent high school record (eighty-five per cent in mathematics, science and English), pass entrance exams, personality and character interviews with members of the board of admissions and the recommendation of their high school officials.

Iron & Steel Exposition Scheduled Sept. 25-28

The greatest display in history of progress made by the iron and steel producing industry and its allied industries will be presented at the 1956 Iron and Steel Exposition and Convention scheduled to be held in the Cleveland Public Auditorium.

Cleveland, Ohio, from September 25-28.

More than two hundred companies will have extensive exhibits and demonstrations of various kinds on a larger scale than ever before. A complete four-day program of technical sessions and related convention activities will center in the auditorium, according to T. J. Ess, managing director of the Association of Iron and Steel Engineers.

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Written Test Required By Civil Service Comm. For Professional Jobs

The Civil Service Commission has announced that candidates for professional positions at grades GS-5 ($4,480 a year) through GS-12 ($7,570 a year) in all Federal agencies will be required to pass a written test if they do not meet the basic educational requirements of a bachelor's degree in engineering.

The Commission emphasized that the change does not make the qualification requirements more rigorous, but provides a fairer method of determining whether persons without full engineering education are capable of performing professional work. The tests are not memory tests, since competitors will be permitted to use reference books during the examination.

Candidates with a professional engineer's license in any state or the District of Columbia need not take the written test. Persons without bachelor's degrees in engineering who are now serving in professional engineering positions in Federal agencies will not be required to take the written test to hold their present jobs or to be promoted, reassigned, or transferred to other engineering positions.

Under this arrangement, the Commission said, adequate professional standards will be maintained and the new plan also may encourage agencies to give more consideration to outstanding technicians who could not otherwise show that they possess the full qualifications required for professional work. The new plan also may facilitate selection for some hard-to-fill vacancies by appointment, promotion, or reassignment.

The new plan, the Civil Service Commission said, is another indication of the Commission's continuing effort to improve examining techniques.

❁

Ohio Attorney General Clarifies Engineer-Surveyor Relationship

Ohio's Attorney General, C. William O'Neill, has advised the Ohio SPE in a formal opinion that the registration laws for professional engineers and surveyors are exclusive and registration under one statute does not confer any rights of practice under the other.

The Ohio SPE had submitted a series of questions to the state's chief legal officer to clarify the situation as to the connection, if any, between the two registration laws. The series of questions asked, in effect, whether a registered engineer could lawfully perform services included within the definition of 'practice of surveying,' and whether registered surveyors could perform services within the definition of 'practice of engineering.'

In his reply, the Attorney General noted that the law prescribes the minimum qualifications necessary for registration in each of the fields separately. He also noted that the law specifically prescribes separate examinations for registration as a surveyor or a professional engineer.

"It is therefore apparent that the legislature has seen fit to require that *all* persons who desire to engage in the 'practice of engineering' . . . present evidence of their qualifications . . . It is further apparent that any person desiring to practice surveying . . . must first become registered as a surveyor," he ruled. "There is nothing in the registration laws which tends to indicate that the legislature intended one of these occupations to encompass or include the other, or that registration of an applicant in either profession would authorize him to engage in the practice of the other."

Young Engineers' Month

To stimulate the interest of junior engineers and young professional engineers, the NSPE Board of Directors has designated the month of November as Young Engineers' Month.

Leland Hobson, chairman of the Young Engineers Committee, recently sent a memorandum to all state and chapter presidents pointing out that there is no group more important to the future growth of chapters and to the National Society than the younger engineers. Attached to the memorandum were suggestions on possible activities for the month.

A special Young Engineers' Night will be held by all chapters participating in the program.

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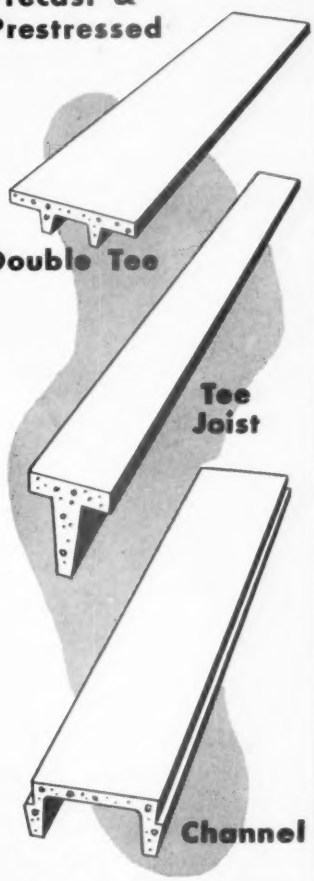

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American Engineer

The Magazine of the Registered Professional Engineer

VOLUME TWENTY-SIX NUMBER EIGHT

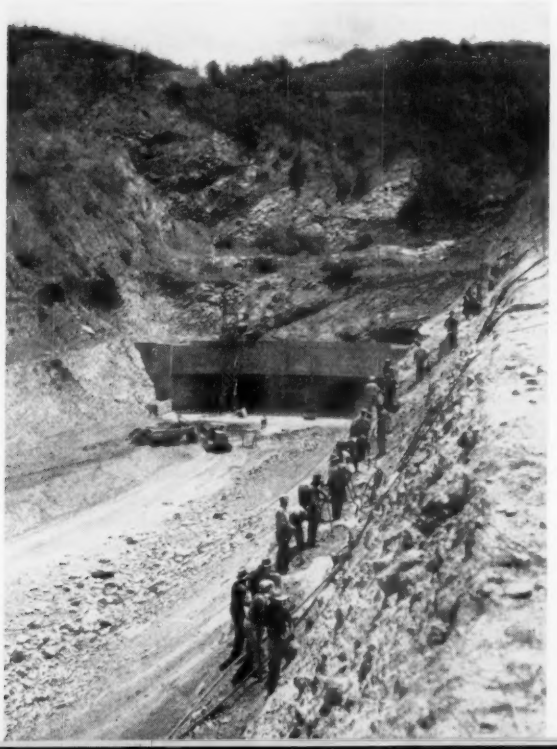
Strengthening America's Engineering Resources

A Hard-Hitting Critical Examination by an Experienced Statesman

By HON. ALEXANDER WILEY

United States Senator from Wisconsin

Russian engineers and technicians are ready, willing, and able to devote their knowledge and skills to large-scale construction projects in the underdeveloped sections of the world.



"Danger—We are falling behind in the race for engineering manpower!"

THIS and a hundred other terse warning signals have been hoisted all over America.

From every forum of public opinion—the press, radio, and television, from the world of science and the world of politics and government, from private industry, labor and agriculture—has come the urgent message: "America must expand its engineering resources!"

Responding to this problem, the great engineering profession itself has applied its enormous talents and abilities toward helping to meet the challenge. Of course, too, in Washington, in the executive branch of our government, significant steps have been taken to take a comprehensive "new look" at why the Soviets are surging ahead of us in the quantity of engineers and technicians.

In the Legislative Branch, as well, as the pages of the AMERICAN ENGINEER have reflected, our senators and representatives in great numbers have focused their attention on this problem.

However, many serious observers are surprised not so much at the engineering shortage, which is, of course, deeply disturbing; they are surprised that it took us so long to wake up to it. They are surprised that at only this late stage have we become aware of the fact that we are falling behind in this stiffly competitive race.

The danger signs were present for us to see, for a long, long time. Even a layman such as myself, who

is not especially familiar with the engineering profession pointed out years ago that America was entering into a dramatic new "engineering age" in which the engineer would play a more important role than ever before in man's history. I pointed out, too, that in this new age, an ambitious totalitarian system such as that of the Soviet Union could set a top-priority target of scientific and technical progress; and it could reach that target by sacrificing all other so-called non-essential activities.

Unfortunately, many complacent Americans tended to downgrade the Kremlin's ruthless determination to build up its "horse-and-buggy" economy, as well as its military prowess. Today, we Americans belatedly face up to the acute three fold challenge of Soviet science and technology:

1. In direct military strength—with the world's largest ground force and air force, and second largest navy.

2. In industrial surges on the home front—in vast Russia, itself, 7.8 million square miles with 200 million people, and in the sprawling slave empire of 700 million more.

3. From outside the Iron Curtain, in the so-called cold war, economic penetration of underdeveloped countries.

Our most serious problem arises, of course, from the crucial Soviet military challenge. A day hardly passes without some new warnings that the Russians are making enormous strides in the fields of supersonic jet fighters and long-range bombers; atomic and hydrogen bombs, with an increased punch of more and more megatons; longer and longer range guided missiles, with even deadlier accuracy. The race for the so-called "ultimate weapon"—the inter-continental ballistic missile—looms by far as the most crucial of all the phases of this many-sided military competition.

But the military race while paramount, is hardly the only competition we face. From my vantage point as Senior Republican on the Senate Committee on Foreign Relations, I can note in civilian fields, the world-wide signs of the forward surge of Soviet engineering. This is evidenced: inside Russia, in its significant build-up of heavy industry, which the Kremlin seeks, as a by-product to display as showpieces to visiting delegations from underdeveloped nations; outside Russia, in its Khruschev-Bulganin-type peaceful economic penetration. This latter phase is best illustrated by the numerous Soviet offers of "loans with no strings attached" for everything from new hydro-electric projects to sewerage systems and road paving in the neutralist, uncommitted bloc of the world.

Consider now, both of these civilian phases—internal and external. Within Russia itself, all observers have agreed that the Reds have made enormous strides in industrialization but, of course, at a staggering price of slavery, mass human misery and deprivation. According to "The National Economy of the USSR" (if you can believe it) between 1940 and 1955:

—Red steel production rose 142%—from 18.3 to 45.3 million tons. (In the same period, free enterprise—American steel output—already at mammoth levels—rose 67%—to 117 million tons.)

—Coal output increased 136%, from 165.9 to 391 million tons. (Comparable U.S. output decreased 3.5%.)

—Soviet oil gushed up 128% to 482.9 million bbls. (U.S. comparison—a rise of 82% to 2.5 billion bbls.)

—Soviet electric power—up 252% to 170.1 killowatt hours annually. (U.S. KW-H rose 275%.)

The same Red report incidentally quotes Soviet educational enrollment of 50 million students, including 1.9 million in technical schools, 1.8 million in colleges, 30 million in high schools. It also boasts a jump in the number of civilian engineers from 289,000 in 1941 to 585,000 in 1955—a 102% increase. In the U.S. our total rose 100%, from 300,000 to 600,000.

THE key fact which must be borne in mind is that all this Red growth was over the base of an exceedingly primitive economy, including an economy devastated in World War II. Obviously, the Kremlin has been absolutely determined to shatter all its previous economic targets—no matter what the price in other sacrifice.

Meanwhile, throughout Asia, the Middle East and Africa, newly sovereign nations with primitive economies of their own, tend to gape in awe at the rise of Communist Russia and China from primitive underdevelopment. What Asia, the Mid-East, and Africa may tend to forget is the blood-price exacted in the growth of these Communist countries. That blood-price was revealed in all its hideous dimensions in Kruschev's denunciation of the murderous tyrant, Stalin.

Trade fairs and industrial exhibits, such as this one in Paris, are being increasingly used by the Soviet planners to demonstrate their technological progress.

Asia, the Mid-East, and Africa may not, however, remember. "If Russia and China could stride forward so rapidly, so can we," say the underdeveloped peoples. "Let us therefore, welcome Soviet and Polish and Czech and Peiping government help," the neutralists continue.

And so, throughout the world the Soviet engineers and technicians are swarming. So, too, Soviet salesmen, representing Iron Curtain publicly-owned enterprises, are offering the widest variety of products in exchange for the products of underdeveloped lands. The Soviets and satellites are particularly willing to take in exchange products which are in surplus and which the free world may not be able to absorb.

Thus, we see the battle for men's minds, as well as the battle for men's pocketbooks and stomachs. Of course, we Americans have been diligent in many respects in combatting the Soviet challenge, military-wise, industrial-wise, and aid-wise, throughout the world.

Our own private enterprise system has been our basic bulwark of strength in exporting both capital and know-how to underdeveloped areas. Private banks and the

World Bank, have helped vitally to initiate development projects, to supplement the efforts of an agency like the International Cooperation Administration, as well as the efforts of the Export-Import Bank. Look at a descriptive world-wide summary and at a globe or a map and you can pinpoint hundreds of far-flung major engineering projects, representing uplifting work on a governmental, semi-governmental and private level.

We have literally "transformed the earth" in country after country. We have helped to bring the Industrial Age to places which were not very long out of the bare beginnings of the Iron Age. American engineers, representing the great corporations of the United States, have built every conceivable type of installation in foreign parts.

A group of Japanese visitors participate in a question and answer session with an American steel company executive. The session was sponsored by the International Cooperation Administration.

The Soviet policy of "economic penetration" is designed to offer advice and aid to underdeveloped countries in all phases of their overall economy—including agriculture.

As a matter of fact, one particular fact has always been somewhat disturbing to me, concerning our governmental aid agencies for economic and technical assistance, with their huge budgets, representing taxpayers' hard-earned savings. It is the fact that the agencies have not utilized to the fullest degree that they should, the services of private engineer consulting firms, or for that matter, of top-notch private economic consultants.

There has, frankly speaking, been too much of a tendency for governmental aid agencies to build up their own bureaucratic empires, huge and unwieldly official staffs. Their concern, in turn, has not always been with an actual private enterprise solution of an underdeveloped nation's problem, but rather, often with merely the filing of a sufficient number of papers, forms and reports for artificial palliatives during a particular fiscal year. My readers may well be familiar with this distinction which I draw and which definitely occurs at times between the work of some government employees in aid agencies and the work of high grade private engineering firms. I don't want to be unfair to the former or to overstate the case for the latter, but I have seen a great many instances, where private business know-how could have accomplished far more than a government payroller's relatively amateurish performance.

I first drew attention to this frequent distinction a good many years ago. My readers may be interested in looking up the May 8, 1950, *Congressional Record* P. 6676, for a discussion of what I believe to have been the serious deficiencies of the then Truman Administration's high-aspiring, but at times low-achieving Point 4 Program. "Get more private engineering know-how," I urged.

My interest then and now was in getting the most effective job done for Uncle Sam at the least possible cost. Private engineering firms these days are hardly lacking in a sufficient amount of business from purely private sources. So, my interest is not in more government business for them, as such, but in more constructive results and yes, more economic results for Uncle Sam. I feel that we of the legislative branch in fulfilling our function of checks and balances with the executive branch, have a responsibility to point out facts of this nature.

PRIVATE business sources which other members on the Foreign Relations Committee have cited a large amount of impressive private engineering or economic work overseas in true free enterprise fashion which our executive branch might well seek to emulate. Consider the very successful (Daniel) Bell Mission, the current programming of industrial development in the Philippines and in Peru, and the development of sulphur reserves in Mexico. If you want specific instances, I cite these without attempting to judge a larger number of worthy counterparts in other areas. But these particular projects involving engineers of international reputation like Michael J. Deutch of Washington, D.C., and economists like Klein and Sachs of New York, indicate what an objective—I emphasize—objective, professional viewpoint can accomplish, in solving a problem, and not just supplying bureaucratic palliatives.

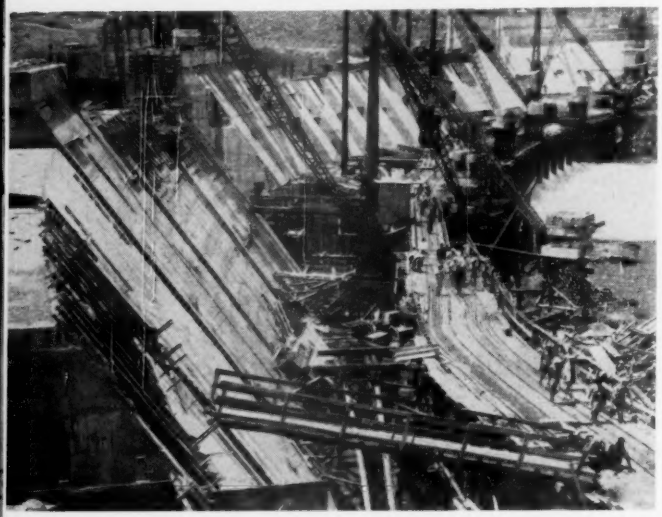
Meanwhile in our own country, the engineer is coming into his own. One can hardly open the business pages of a magazine or newspaper without reading that an engineer has become president or chairman of the board of some great American corporation. But where is the engineering leadership of tomorrow? And how are we

going to get a sufficient number of engineers in the first place? In other words, what are we going to do to lick the engineering shortage?

Let me suggest just a few of what should be our minimum approaches. Let me later spell out background reasons behind a few of these approaches.

1. We must take comprehensive steps to bring effectively and continually to the attention of the youngsters in our grade schools and high schools—particularly our still untapped womanpower—the opportunities available in an engineering career.

2. Basically, in counseling both boys and girls in their early years in school, we must seek the fullest possible emphasis on science and mechanics for those who show aptitude in these fields.



"If Russia and China could stride forward so rapidly, so can we, say the underdeveloped peoples. Let us therefore, welcome Soviet and Polish and Czech and Peiping government help, the neutralists continue."

3. We must help improve over-all quality of the great American teaching profession. It is the teacher—math, physics and others—who will help fan the spark of engineering talent which a youngster may show at an early age. Such a teacher must, in turn, be properly paid, must have appropriate recognition from society, must be properly trained in his or her own right in order to be able to bring out the best in talent.

4. We must increase our understanding of the reasons for drop-outs from the grade schools, as well as from the high schools, colleges and universities of our land. We must take remedial steps to minimize those drop-outs, both within school and between the various steps up the ladder of education. Such efforts against drop-outs must include: a. Making more generally available accurate, directly useful information on sources of scholarships, tuition grants, loan funds, and the like. b. Considering the expansion of our own Federal programs for scholarships for talented individuals.

5. Through the tax laws and any other means, we must encourage the great private enterprise system of America to help strengthen our engineering resource. We must give encouragement and inducements to industry to broaden the base of our engineering talent and to sharpen its proficiency.

6. We must take whatever steps are necessary to help strengthen the great private and public university system in America, so as to increase its ability to help meet this problem in all fields of engineering.

7. We must strengthen Uncle Sam's own program for recruitment and maintenance of engineering talent. The Federal Government must be able to get, and keep, for as long as necessary, the top talent which it needs in all fields of endeavor, particularly in military application.

8. Simultaneously, the Federal Government must consider still further expansion of its existing university and private contract work for research and development.

THESE, then, are but a few of the facets of our meeting this shortage problem. I have not attempted to specify all the possible remedies, because I do not presume that any single layman, myself or anyone else, can come up with all or even most of the answers. But I feel certain that by diligent teamwork among all interested sources, we can begin to make a dent in the critical manpower situation.

Now, let me spell out just a few of the background reasons for my suggestions. And let me touch upon a few areas which much of our public may tend to underestimate.

In the first instance, we are not simply seeking a vastly expanded quantity of engineers; naturally, we want an ever improved quality of engineers. We have good reason to be proud that our American engineers rank so high from the standpoint of quality. And we are interested in maintaining and increasing that qualitative superiority. I welcome, therefore, the splendid efforts being made by much of American industry in encouraging its existing engineers to sharpen their talent through post-graduate work.

Unfortunately, the percentage of engineers taking post-graduate studies has been dropping instead of increasing. So, many private companies' foresight in now encouraging more of their engineering talent to study for their doctorates comes, at a most opportune time. Moreover, companies have set up programs to send at least a few of their top engineers to graduate schools full time. Others are planning to send their personnel to special graduate courses for a few hours a week on company time. Some are trying to persuade graduate school facilities to set up off-campus schools for their engineers. They are offering to help these schools build facilities and they are even helping to pay instructors.

A second point which many Americans tend to lose sight of is the fact that almost invariably when we talk of the engineering profession, we think of male engineers. Here in the United States, despite the magnificent opportunities which we offer to our women folk and despite their usual splendid capitalization on such opportunities, they surely have not made full contribution in this particular field. Since 1953, when bachelor degrees in engineering were granted to 33 women, the number rose to 62 for each of the following years. But of all the students enrolled in engineering in 1955, less than one-half of one per cent, or only 1074 were women.

CONTRAST this with the situation in Soviet Russia. In 1940, the Soviets credited women with constituting 19.4 per cent of their engineering force. An analysis in our own country of the 1950 census, reported by the Scientific Manpower Commission, showed that only 0.7 per cent of all the employed engineers were women. That certainly indicates the present need of more American lady engineers.

(Continued on page 46)

Engineering Employment Practices

Digest

A short digest of a monthly bulletin published by the National Society of Professional Engineers in the interest of advancing cooperative relations between professional engineers and their employers. To regularly receive the complete publication which is distributed widely to industrial, commercial and educational organizations, write the NSPE, 2029 K St., N.W., Washington 6, D. C.

✓ **The Ninth Circuit Court of Appeals has ruled that an engineer-employee who acted as an employment agent to procure offers from competitors for engineers working for his employer was lawfully discharged under the Taft-Hartley Act, since the actions of the employee were inimical to the vital interests of his company and constituted disloyalty.**

The case, which goes back to 1953, involved the Seattle Professional Engineering Employees Association (ESA) and the Boeing Airplane Co. In order to bring pressure on the company, the union set up a Manpower Availability Conference which was intended to place Boeing engineers in new jobs in other companies. Boeing fired the union member in charge of the conference and the National Labor Relations Board, overruling its Trial Examiner, held the discharge was unlawful because it penalized conduct protected by the law on behalf of collective bargaining. The conference failed to achieve its results and, in fact, was never held as only 18 replies were received from 2800 invitations to other employers.

The Court of Appeals reversed the NLRB, declaring: "Unless ordinary ethical concepts have been entirely obliterated, his enterprise was, upon its face, indefensible and disloyal. It has always been thought unethical for one business firm to attempt to seduce by underhand methods employees of another to leave their jobs. But here an employee of Boeing was offering himself as the agent of competitors to accomplish that very object."

* * * * *

✓ A survey by *Aviation Week* (May 14, 1956) on why engineers change jobs discloses higher salary, opportunity for greater responsibility and geographical considerations are the three major job motivation factors. The companies put opportunity for greater responsibility in the No. 1 position, geographical considerations, second, and higher salary, third. The engineers put salary first, then opportunity and location third.

* * * * *

✓ *Rep. James C. Davis of Georgia, chairman of the House Subcommittee on Manpower Utilization, has called upon the Secretary of Defense and the Civil Service Commission to conduct a special study on the utilization of engineers and scientists in Government and private research and development organizations holding Government contracts. He said he is particularly concerned about industries with cost-plus contracts who are hiring the best scientists and engineers away from the Government. The least we can do, he said, is insist that they be certain they really need the ones they already have. The study will also review engineering and scientific personnel utilization practices in Government agencies.*

* * * * *

✓ **Two members of the House Civil Service Commission have introduced legislation to establish a Scientific and Professional Schedule for Federal Government engineers, scientists and other professional personnel. They propose ten new grades with a salary scale range from $4,480-$5,000 for Grade 1 to $17,500 for the highest grade. Representatives Moss and Gubser say the lack of engineers and scientists in the Federal service must be met by revamping the present antiquated pay system on a permanent long-range basis. NSPE is in favor of restoring the professional classification for Federal engineers.**

* * * * *

✓ A survey of women engineers reported by the Department of Labor reveals an estimated 3,600 professionally-qualified women engineers in 1954. Two-thirds are in engineering; majority work in design, development or research; median salaries are highest in self-employment ($6,125), with Federal employment next ($6,100) . . . Reports from ten schools on civil engineering graduates show average starting salaries for civils at $420 plus; high salary offers alone were not controlling; government did poorly; trend toward disregarding branch in selection . . . To obtain the needed engineers for the expanded highway program, American Road Builders' Association recommends emphasis on competitive salaries, greater use of specialized equipment to decrease the monotony of detail work, provisions for job security, full professional responsibility and full recognition of professional status. The complete report—"The Highway Construction Industry in a Long Range National Highway Program," is available from ARBA, World Center Bldg., Washington 6, D. C. at $2.00 per copy.

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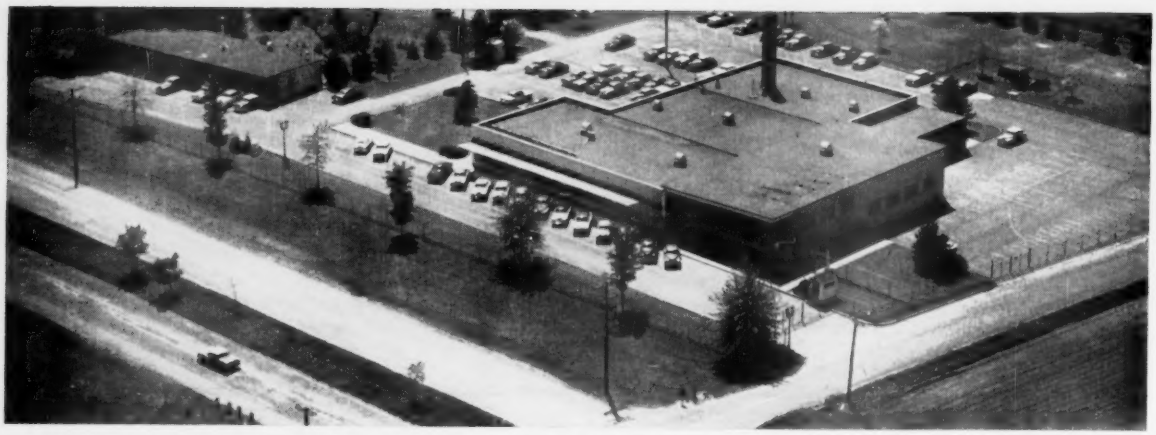
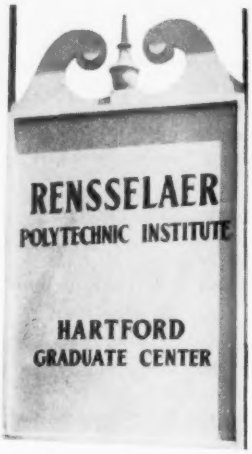


Aerial view of the Rensselaer Polytechnic Institute Hartford Graduate Center. Purchased by United Aircraft Corporation at a cost of about $600,000, the former shopping center was completely remodeled and presented as an outright gift to R.P.I. The facility has 10 classrooms, one lecture hall, one library, two laboratories, two seminar rooms, 13 professor's offices, one main office, and a cafeteria. The center occupies six acres of land.

Better Educated Engineers Thanks to United Aircraft-Rensselaer 'Teamwork'



• An American Engineer Photo Story •

A MODERNISTIC brick and glass building, built in the postwar years as a suburban shopping center and used later as a nuclear aircraft engine research facility, has been converted by Rensselaer Polytechnic Institute into a busy engineering graduate center.

The facility is located in South Windsor, Connecticut. It opens the way for hundreds of engineers living in Southwestern New England to study for master's degrees without following the customary routine of obtaining a leave of absence, going away to some college for advanced study, and further educating themselves at their own expense and without pay.

The R.P.I. Hartford Graduate Center opened in September, 1955, with an enrollment of 212 students. While most of them came from United Aircraft Corporation's divisions, the center is open to all, including engineers and scientists who enter under fellowship grants written by their companies and individuals without company affiliations. Beginning next fall, several additional companies plan to sponsor fellowship programs for their employees and a large number of individuals have applied for admission.

The off-campus center was initiated by United Aircraft Corporation which had originally leased the facility for its nuclear-powered aircraft engine work, now transferred to a new plant. The corporation hit upon the idea of an area graduate center to aid in the recruiting of new engineers and to retain those already in its employ.

When approached on the subject, Dr. Livingston W. Houston, president of Rensselaer, was enthusiastic. He insisted, however, that the college could only conduct the facility if it were entirely under R.P.I.'s supervision and operation. The standards, rules, and regulations also had to be the same as those applying at the Graduate Division on its main campus in Troy, Dr. Houston stipulated.

This was precisely what United Aircraft Corporation wanted. At a cost of about $600,000 UAC purchased the land and the buildings, altered and equipped the center, and then presented it to R.P.I. as an outright gift. United Aircraft Corporation has also agreed to provide up to $260,000 a year for the next five years toward the cost of the center's operation.

Instruction during the first year was mainly in the field of aeronautical engineering, mechanical engineering, and applied mechanics. The bulk of the enrollment consisted of UAC's Pratt & Whitney Aircraft engineers, since the engine division has experienced the region's most critical shortage of engineers and scientists over the past several years.

Under United Aircraft Corporation's plan, its own engineers and scientists can now obtain a graduate degree free, and meantime receive full pay for engineering work. Under the company's annual payments to the R.P.I. Hartford Graduate Center, the student is rebated half his per semester hour tuition deposit when he completes a course. When he gets a degree, he gets back the other half.

The academic schedule is planned so that the student may obtain his master's degree in about five semesters of fifteen weeks each, with a normal schedule of six credit hours a semester. The academic calendar is essentially the same as that at the Troy campus. During the first semester, courses offered were in seven fields—aeronautical engineering, mathematics, mechanical engineering, mechanics, nuclear technology, physics, and management engineering.

To apply for admission to the graduate center, engineers must furnish Rensselaer with transcripts of their grades and take the aptitude test set forth by the Graduate Record Examination of the Educational Testing Service.

To avoid overspecialization, R.P.I. encourages students to do major work in one field and minor work in at least another. The program is flexible enough to enable each student, according to his bent, to develop a course of studies directed toward his particular objectives. Students must receive a B or better in each major course and a B average for all courses to qualify for a degree.

DEGREES are conferred at the regular R.P.I. commencement exercises held on the Troy campus. United Aircraft Corporation will grant a one-day leave of absence with pay while the engineer receives his degree at these exercises.

To obtain his degree, an engineer must complete at least thirty credit hours with satisfactory grades; satisfy residence requirements, and present a thesis if the advisor requires it. At least half of the total credits presented toward a degree must be taken in required courses, and requirements must be completed within five years.

United's students range in ages from 21 to 50, with the average being 28. Most are married. Those whose classes begin at 3:45 p.m. are excused from their aircraft jobs without loss of pay. They attend two classes a night, two days a week. Each class lasts one and one-half hours.

Since its conversion, R.P.I. faculty members say the former shopping center has made a handsome and ideal graduate center. It contains over 22,000 square feet and students pursue their studies in a full-fledged, self-sufficient educational plant. Its facilities are presently complete to eight classrooms, a library large enough for 64 persons to work in comfortably, a cafeteria seating 72 persons, a lecture room accommodating 165 students, a physics laboratory, a mechanical behavior of metals laboratory, and two seminar rooms, each seating 14 persons at conference tables. The center has an adjoining parking area for several hundred cars, and a surrounding campus of six acres of land.

Dr. Warren C. Stoker, associate director of Rensselaer's Graduate Division and formerly director of its computer laboratory, is director of the center. Under him is a faculty of twenty-eight which includes some of R.P.I.'s top teachers. They are assisted by a number of specially qualified scientists and engineers from United Aircraft Corporation.

In summing up the R.P.I. Hartford Graduate Center, William P. Gwinn, president of United Aircraft Corporation, said: "We established the facility so that our engineers could widen their basic knowledge in fields that are moving rapidly, affording the ambitious engineer an opportunity to obtain more schooling at the same time that he continues in his vital work with us. We would not have undertaken that costly program if we had not judged it an absolute necessity."

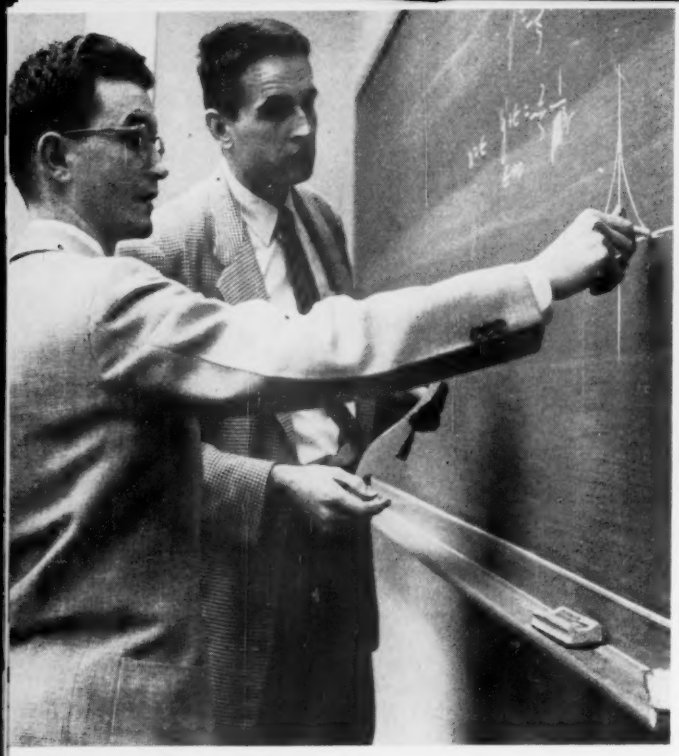
From an industrial standpoint, United Aircraft Corporation, besides helping to alleviate a mounting engineering problem on an internal basis has made a great contribution in which all the community can share. On the other hand, the venture gives R.P.I. an unprecedented view of the industrial laboratory where complex problems—design, experimentation, and production—are being solved.

As Dr. Houston recently said, "This process might well supply a pattern of education which would go a long way toward solving the demand by industry for more immediate technological manpower."—*End.*

(More photos on next page.)

Pleasing combinations of brick, glass, stone, and tile, give R.P.I.'s Hartford Graduate Center a modernistic look. The off-campus facility opened in September, 1955, with an enrollment of 212 engineers. Enrollment will be considerably larger and is open to any qualified person.

The lobby of the South Windsor, Connecticut, graduate school is light and airy. Two engineers relax between classes. Murals on the wall represent the Rensselaer Polytechnic Institute campus, in Troy, New York.



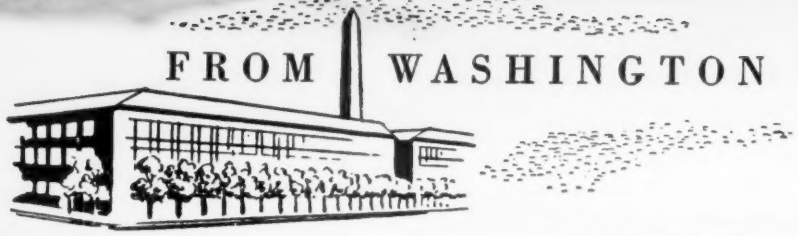
Above: Two United Aircraft Corporation engineers work out a problem at the blackboard. After five 15-week semesters the students can obtain their master's degree. Semesters consist of six credit hours and the academic calendar is essentially the same as at the Graduate Division, Rensselaer Polytechnic Institute, in Troy, New York.

Below, right: A typical class at Rensselaer Polytechnic Institute's Hartford Graduate Center, Hartford, Conn., where working engineers and scientists are pursuing graduate studies to help them meet complex problems.

Below: Faculty members make themselves available for private conferences with students. Dr. Warren C. Stoker is director of the Hartford Graduate Center and has a faculty of 28 teachers. In the picture, Professor B. R. Onuf, center, discusses a project on heat transfer with two United Aircraft Corporation engineers.

Above: Between the job and the classroom, working scientists and engineers eat supper. Average age of students is 28 and most are married. By studying at the R.P.I. Hartford Graduate Center they can obtain master's degrees without giving up their jobs. R.P.I. owns the facility and all rules, regulations, and academic standards are the same as the Graduate Division, in Troy, New York.

Below: With the day's activities finished, two students chat awhile before journeying home where more "lamp-burning" awaits them.



By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

ENGINEERING MANPOWER ISSUE IN REACTOR DEBATE

WHEN the political welkin starts to ring this fall much will be heard about the issue of natural resource development by private industry or by Government, with such well known names as Niagara River Power Project and Hells Canyon Dam figuring prominently in the debate. Another aspect of the same issue appears to be shaping up for the campaign, containing long-range implications in the power development question and, in addition, controversy over the most effective placement and utilization of engineers and scientists.

The construction of atomic reactor facilities is becoming more involved in national political issues, and controversies over public vs. private development are sure to be campaign topics for a good many years to come. Shown here is a model of a proposed medical research reactor which will be a permanent hospital installation.

The immediate question now before Congress is whether the Government, through the Atomic Energy Commission, should undertake the construction of demonstration prototype reactors designed to show the practical value of facilities for the generation of electric energy in industrial or commercial quantities. The Senate has passed a bill authorizing $400 million for such a program, and it is now pending before the House. Although the President never commits himself in advance on such matters, it is reported from reliable sources that if the bill reaches the White House it will be vetoed. Based on the Senate vote the veto could not be over-ridden and such a result would throw the issue into the middle of the political campaign. Senator Gore of Tennessee, one of the bill's major sponsors, has said the atomic power plant measure will be one of the keystones of a four-point public power program he expects the Democrats to spell out in their platform at the convention in August.

The heart of the issue is the realization that some day atomic power will be a major source of commercial electrical energy. Those who oppose the direct Government program fear that Federal prototype construction may be a "foot in the door" which will lead eventually to the Government taking over the power industry or having a major part of power generation facilities. On the other side, the sponsors of the bill declare that the United States is lagging in the development of nuclear energy for commercial purposes because we have depended upon private enterprise which does not have the economic motivation to take the financial risk for equipment which may become obsolete before it is completed, and which may never, in fact, be a profitable venture.

Disagreement over the question of U. S. leadership in atomic power development, and whether the Atomic Energy Commission's current experimental-type program is the best approach, extends to the membership of the AEC. Lewis L. Strauss, chairman of the Commission, says it would be "foolish" for the U. S. to embark on a "crash program" of building reactors just to keep ahead of Russia in a "kilowatt race." He argues that the U. S., with an abundant supply of conventional power, does not have the urgent need for nuclear power that exists in some countries and, therefore, it makes more sense for this country to devote its efforts to improving the technology of power reactors instead of "freezing it by large monetary commitments to existing uneconomic types of reactors." AEC Commissioner Thomas E. Murray, who is a professional engineer, contends, however, "the present prospect of getting any substantial quantity of industrial atomic power in this country by 1960 is very gloomy—and getting more gloomy every day." The engineer-member of the Commission says the Government has prematurely abdicated to private industry the primary responsibility for building large power reactors and we should not fear that government will enter the power business as a consequence of accelerating development through power reactor construction.

(Please turn the page)

Late and Important:

As we go to press, the House has killed the bill discussed above by a vote of 203 to 191.

Intertwined throughout the Senate debate was a pointed discussion about the effects of the proposed Federal program on the engineering-scientific manpower supply situation and the practical difficulties of an expanded program in terms of securing the specialized personnel. Senator Bourke B. Hickenlooper of Iowa, former chairman of the Joint Committee on Atomic Energy, who led the opposition to the bill, declared "here is a compulsory program to divert more technology, more scientists . . . away from the weapons program which many claim is vitally needed for the security of our country. It takes technicians to build these unknown and experimental plants."

To this he added: "We have heard a great deal—and I believe with considerable merit and considerable basis of support—about the shortage of scientists and highly trained technicians in connection with this and other similar programs. I think we could use a great many more scientists and technicians than we have. I think the Atomic Energy Commission is getting its fair share. In the entire field of atomic energy production, I think it is getting its fair share of scientists and technicians, as compared with universities and industries. Nevertheless, there is a shortage. If, for purely experimental purposes, we expand this large reactor program, it will require additional scientists, and there is no place to obtain them in sufficient numbers unless we dilute our already diluted weapons program and peaceful experimental development program, which the Commission already has under way. This would cause an additional shortage."

Conversely, however, Senator Clinton P. Anderson, of New Mexico, chairman of the Joint Committee, contended that "ever since the AEC was established, whenever any new or expanded program is proposed, the scarcity of manpower is used as a reason for opposing it. Scientific and technical manpower has always been scarce in the atomic energy program, but somehow it has been possible to recruit people and do a remarkable job in a short period of time." He said that as a means of broadening the manpower base, the AEC should bring in qualified new contractors "who can divert engineers from less important work," and he said the hearings on the bill showed that forty qualified contractors with some atomic energy experience stated they could take on an additional reactor project. Senator Anderson also quoted Commissioner Murray's statement that the location of the protoype projects at AEC production sites will help the manpower situation by permitting the upgrading of technical and service personnel at the site, and it will be conducive to collaboration by existing laboratories at the sites and promote the utilization of existing laboratory personnel—"all of which tend to conserve manpower." Senator Anderson also added the argument that "because of AEC's insistence on not going into prototype development and construction it is losing many qualified engineers and technicians who are interested in this type of experience." The passage of the bill, he said, would reverse this trend and stop the drain of manpower.

Directly related to this manpower question is another pending measure about which there appears to be no dispute within the AEC or with Congress. The Joint Committee at the request of the AEC, has approved an amendment to the basic atomic energy law to clarify the authority of the Commission to make arrangements for education and training of specialized personnel and expressly authorize the Commission to make grants and contributions to the cost of reactors and other equipment for training purposes. The AEC told Congress it needed the additional authority "to meet a critical shortage in the atomic energy program—the shortage of trained scientists and engineers." The Joint Committee said the AEC is now doing everything possible within its existing statutory powers to help educational institutions alleviate the shortage.

◀ Senator Clinton P. Anderson of New Mexico

Senator Bourke B. Hickenlooper ▶ of Iowa

In addition to on-the-job training for Commission and contractor personnel, it is conducting the Oak Ridge and Argonne schools of reactor technology, and it is now negotiating contracts with two universities for courses which will supplement training given at Argonne. The Commission is also planning an expanded fellowship program. The Joint Committee said no universities now have the complete facilities which are necessary to adequately train engineers to work in the atomic energy industry. "In view of the expense of such facilities and the urgency of the demand for a rapidly increased rate of training, the Commission desires authority to contribute to accredited educational institutions part of the cost of acquisition of the facilities of the type mentioned. (Operating reactors, heat transfer loops, metallurgical equipment suitable for working with uranium and thorium, etc.)

The Joint Committee added that it is hoped that once private educational institutions have become equipped with the needed facilities, it will no longer be necessary for the Commission to continue its teaching programs at Oak Ridge and Argonne.

Engineer-Employer Criteria Printed

By WAYNE E. AULT, P.E.,

Chairman, Engineer-in-Industry Subcommittee

THE *Criteria for Professional Employment of Engineers* has now been published in booklet form and is being circulated widely to management, government officials, educators, associations and other groups. It is equally important that individual professional engineers be familiar with the content of the new publication.

As reported last month, the *Criteria* was prepared by the Engineer-in-Industry Subcommittee as part of the continuing program to improve professional employee-management relationships and was approved by the NSPE Board of Directors at the annual meeting. Following that approval the preliminary copy was given wide circulation to the engineering press and as a result of the publicity generated by this action there is already a large backlog of orders for copies of the printed edition. The booklet, as printed, has been supplemented with footnote references to additional material bearing on particular points suggested in the document.

Under the plan developed by the Subcommittee, the *Criteria* consists of two major divisions with subheadings as follows:

Criteria for Employers	*Criteria for Individual Engineers*
Recruitment Policies	**Application for Employment**
Indoctrination	**Interview**
Technical Development of the Individual	**Indoctrination**
Administrative Development of the Individual	**Technical Development of the Individual**
Professional Development of the Individual	**Administrative Development of the Individual**
Personality Development of the Individual	**Professional Development of the Individual**
Company Practices	**Personality Development of the Individual**
Working Conditions	**Company Practices**
Salaries	**Working Conditions**
Engineering Titles	**Salaries**
Personnel Practices	**Engineering Titles**
Termination Policies	**Personnel Practices**
	Termination Policies

Under each of these headings the Subcommittee has stated a suggested principle which can be applied by the employer or the professional employee, as the case may be, to bring actual practices into compliance with the concepts of professional recognition and professional responsibility. These statements of principle are followed in each case by a series of questions which are designed to develop the specific point of actual current practice, and also to suggest the recommended practice. For example, under "Salaries," the employer is asked, "Is the salary schedule by grades made available to all engineers?" Under the same heading for the professional employee the question is asked, "Have you made reference to appropriate salary studies of professional engineering societies in evaluating your salary?" Altogether there are 150 questions in the two parts.

The introduction to the publication points out that engineering as a profession is well established from the legal standpoint. But the statement continues: "These forms of recognition are, in a sense however, in the abstract. As necessary and important as they are to the engineering profession, there remains open to discussion the factual and practical aspect of professional recognition in the day-by-day life of the engineer." The major purpose of the *Criteria* is perhaps best summarized by the continuing language from the introduction:

"As most engineers are employees, professional recognition is most significant in its application to the employed engineer-employer relationship. The professional status of the employed engineer, in all of its manifold aspects, needs to be fully recognized by the employed engineer and his employer if full and complete professional growth of the engineering profession is to be developed.

"Although the attitudes and performance of the employed engineer have a considerable bearing on his professional status and development, it is inevitable that to a large measure the employer's attitudes and policies control

(Continued on page 47)

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Three Task Force Units Formed to Handle Specific Problems Facing Group . . .

Opportunity for Action Offered Thru Consultants' Functional Section

"OPPORTUNITY" best describes the results of actions taken at the annual meeting at Atlantic City, May 24-26. An amendment to the Bylaws of the Society was approved by the Board of Directors setting up the ground rules whereby functional sections could be formed and operate within the framework of the National Society. The section for Consulting Engineers in Private Practice was formed on May 25.

The NSPE Board in its morning session Thursday, May 24, heard Vice President Garvin Dyer, P.E., (liaison officer for the Professional Practices Committees) present a statement on status and prior actions relating to functional sections. Chairman Earl Christian, P.E., of the Constitution and Bylaws Committee read the newly proposed Bylaw 22. After thorough discussion it was adopted with two minor amendments. NSPE members participating in the national sections, will, according to the first amendment, be known as "participants." The second amendment served to clarify references to the section's executive committee. Discussion properly concerned possible encroachment on or by-passing of the fundamental constitutional relations between chapter, state and national societies. It was concluded by the Board that Bylaw 22 complied with these necessities as well as with prior Board actions. The Bylaw was adopted.

John B. McGaughy, P.E., chairman of NSPE Engineering Practices Committee, opened the Friday morning conference for Consulting Engineers in Private Practice with a review of the considerations, requests, committee reports and Board actions to date. Present were some seventy participants from twenty-four states ranging from Massachusetts to Arizona and Washington to Florida. About a dozen observers were present. It was unanimously agreed that a national functional section could adequately provide the forum for discussion of those problems troubling the engineers in private practice and that therefore such a section should be organized. A. C. Kirkwood, P.E., of Kansas City, Mo., was elected chairman of the section. Pursuant to Bylaw 22, six regional vice chairmen were nominated by a committee appointed by the section chairman. The participants agreed with the committee (T. Carr Forrest, P.E., of Texas, chairman, A. George Mallis, P.E., of Massachusetts and Donald D. Smith, P.E., of Pennsylvania) resulting in the election of vice chairmen:

Northeastern Region:
William H. Austin, P.E., West Cheshire, Connecticut

Southeastern Region:
Harvey F. Pierce, P.E., Miami, Florida

A. C. Kirkwood, P.E., right, of Kansas City, Mo., was elected chairman of the functional section.

Central Region:
Elmer S. Barrett, P.E., Chillicothe, Ohio

North Central Region:
H. R. Veenstra, P.E., Muscatine, Iowa

Southwestern Region:
George F. West, P.E., Houston, Texas

Western:
Kendall M. Wood, P.E., Spokane, Washington

It had been agreed that in selecting vice chairmen there should be an equitable recognition of technical interests. This the nominating committee did, there being three civil engineers, one architectural engineer, one mechanical engineer and one mechanical-electrical engineer. H. C. Trester, P.E., of Wisconsin, was elected secretary. The above officers of the section will constitute its executive committee, and the group assembled instructed its new officers to appoint task forces to begin work immediately in those areas of concern to the Engineer in Private Practice.

Three undertakings were authorized for immediate action. In so doing the participants acknowledged fully the requirements of constitution and bylaws affecting the tri-level organization of national, state and local societies as well as the relation at each level of the section to its society. Hence, the national functional section will do those things which are national in scope and purpose, or which the state sections request undertaken, or which the NSPE refers to the national section for action. These will include making available through normal channels the results of all undertakings.

The first task is to establish essential rules of government and operation. Designated Task Force #1 pending approval and adoption of the results of their efforts, they are under the chairmanship of Leslie C. Gates, P.E., of West Virginia. The section executive committee will de-

It is believed that the new national functional section can provide a forum for discussion of problems confronting the engineer in private practice.

sire their reports in time for submission to the NSPE Board prior to its fall meeting.

Task Force #2 will be concerned with a continuing compilation and comparison of fee schedules plus incidental regulations and practices.

Task Force #3 is to study and compile, on a continuing basis, the subject of ethical practices—requirements, control and discipline in the several states. These task forces are currently under selection.

Many professional engineers have contributed much to bring about the opportunities now available in NSPE through functional sections. A tremendous amount of cooperative effort is needed to guide and maintain the sections as effective arms of the NSPE.

The section executive committee at its initial meeting made it crystal clear that they are not going to take any action at a national level which might encroach on state autonomy. It is their intention to assist, to cooperate, and to undertake studies that will be of assistance to the state societies. This will avoid much duplication and make information available to the state societies quicker and with less effort. It is the purpose of the section to provide on a national basis effective forums where members of the Society with common interests can express themselves and have united action within the group.

State societies who now have corresponding functional groups, or who may be contemplating their formation, are urged to call on the vice chairman in their particular region for any assistance that he may be able to provide in the implementing of the state functional group activity.

It is anticipated that the entire membership of the National Society of Professional Engineers will watch the development of this first functional section at national level, and the experiences gained in this pilot operation may well be of benefit to future functional section activity in other fields, both at national and state level.—***End.***

Task Force #1

Leslie C. Gates, P.E., P.O. Box 672, Beckley, West Virginia, chairman.

A Division—Rules of Government & Operation

Clifford L. Dier, P.E., 1420 Washington St., Lincoln 2, Nebraska, vice chairman.

Edward Larson, P.E., 830 Main St., Cincinnati, Ohio.

John B. McGaughy, P.E., 220 W. Freemason St., Norfolk, Virginia.

L. L. Dresser, P.E., P.O. Box 2518, Tulsa, Oklahoma.

Philip W. Genovese, P.E., 294 Elm St., New Haven, Connecticut.

B Division—Budget Considerations

Warner Howe, P.E., 76 Porter Building, Memphis, Tennessee, vice chairman.

Ritchie Lawrie, Jr., P.E., 321 N. Front St., Harrisburg, Pennsylvania.

Owen W. Turpin, P.E., 1003 N. Charles St., Baltimore, Maryland.

Task Force #2

Compilation & Comparison of Fee Schedules

Frank E. Sanford, P.E., 252 W. Cortland St., Jackson, Michigan, chairman.

John E. Lane, P.E., 1214 E. 10th St., Brooklyn, New York.

Donald D. Smith, P.E., (to be supplied later)

Task Force #3

Study & Compilation of Ethical Practice—Requirements, Control and Discipline in the Several States

A. George Mallis, P.E., 121 Chestnut St., Springfield, Massachusetts, chairman.

George S. Rawlings, P.E., P.O. Box 1902, Charlotte, North Carolina.

Sidney Stolte, P.E., 1437 Marshall St., St. Paul 4, Minnesota.

Do You Like Articles That Are 'Different'? Then Put on Your 'Deep' Thinking Cap and Try This . . .

Higher Values in Human Engineering

By E. V. Crane, P.E.,

Director of Research, E. W. Bliss Company, Canton, Ohio

SUCH diversified professional interests as personnel and client relationships, creative development and constructive thinking do demonstrate a certain common ground. What will prove to be spiritual ingredients are found in intellectual integrity, sound judgment and creative thinking. These rather intangible assets are too easily forgotten under business stress and neurotic compulsion. Too many engineering executives have fought the preventable retribution of digestive disturbance, heart troubles and nervous exhaustion, when they should have been rising to the height of their careers. It was such an experience with lost health at a critical time which resulted in the gathering of the data reported here.

Human engineering must formulate for the profession, those mental and physical relationships which must be understood if we are to adequately fulfill our function as engineers. It is a good electrical engineering problem for the basic neural systems are electrical. They do not violate any of the timeless laws of science which research is still struggling to understand.

Some ten billion neurons or brain cells are the building blocks of these systems. Neurons are specialized in various ways for the various functions of receiving, transmitting, storing, evaluating, adjusting and stimulating. Tiny as they are, each one is a complex living structure, taking in its own nourishment, expelling its wastes and generating its electrical energy requirements. Each extends a hollow conductor or nerve fiber in one direction for receiving purposes, and another in some other direction with possible branch connections for sending purposes. Some of these cells and their conductors are grouped in transmissions systems throughout the body, in connection with muscles, skin functions and internal organs. The greater number however are organized in groups or mental bodies within the brain envelope for particular functions. Whether each neuron's memory is electromagnetic, photoelectric, or more probably a pattern ionization of the cell's complex molecular structure, is yet to be determined.

Light waves, heat waves, odor waves and sound waves are picked up at the specialized nerve tip receivers grouped in the eyes, the skin, the nasal passages and the ear respectively. All of these wave receptions are changed into electrical wave forms for internal transmission. Ample evidence continues to accumulate that radio and radar type waves of the intermediate range between light and sound, are also provided for in nature and in the human system. All of these are invisible and intangible but understood among engineers. To be sure the structure uses organic materials with the built-in maintenance features so remarkably distinctive of life. The voltages, amperages and resistances are extremely small compared with relatively crude commercial practices, but have been recorded.

For engineering purposes, the division of labor among the mental bodies may best be visualized by considering four ranges or levels of thinking:

1. Subconscious physical *and mental* routines of the voluntary system. These are used (with or) without the immediate supervision of conscious attention; feeding a machine, the knitting stitch, a routine greeting, etc.
2. Conscious manipulation of learned wisdom, routines and methods, without however, going beyond that which was previously learned.
3. Constructive thinking, which builds beyond previous accomplishment of the individual. This process adds to learned wisdom and conscious consideration, the evaluating facilities of a third mental body. Engineers must know and use this asset.
4. Inspired creative thinking which engineers seek to attain and which distinguished the genius of Edison, Carver and Steinmetz. This level goes beyond the normal expectancy of the others and provides evidence of the use of man's greatest gift.

These four levels represent the successive collaboration of four mental bodies assigned to two nervous systems. Specialists in various branches of research have contributed enough to permit a general identification of these groups.

THE first step is to observe the dual role of the two major systems. The more familiar one is the *voluntary system* which includes the conscious and subconscious mental bodies and the nerve control of those muscles which produce voluntary movement and speech.

The other is the *autonomic* (meaning self-governing) *system*. Its mental bodies occupy the best protected position at the heart of the brain group, and provide the advisory, impelling and evaluating qualities which appear in the third and fourth levels of thinking. This system also includes subordinate bodies, nerve pathways and hormone producing glands. These instinctively control the electrochemical replenishing, and the expending of the reserves which provide the power for physical and mental accomplishment. While this entire system was lumped with the subconscious when little was known about it, we may now observe that it is beyond, and, in some respects, supervisory to the voluntary areas.

Distinctions between the two systems are simply illustrated by their dual control of the facial and vocal muscles. A smile, a scream, a frown, a chuckle, etc., is learned and voluntarily controlled from motor neurons of the cerebral cortex. This area may be damaged in a stroke, limiting voluntary control to only one side of the face, but without affecting involuntary control (which originates in motor neurons of the thalamus in the autonomic

system). Note that involuntary facial and vocal expressions are actually *evaluations* of the current situation with finely shaded meaning. Thus I may involuntarily betray that I like it, or am doubtful, or curious, or I am disturbed, or cautious, or enraged, or frightened. These and more are within the autonomic range of weighing and expressing.

A difficult hurdle in learning to make the best use of the two systems is to understand the differences in their feed-back signals to us.

To "us?" We, at our conscious command post, are not directly aware of what goes on in the other mental bodies. At this area of consciousness we exercise our privilege of self-determination, of gathering pertinent material, considering it, making decisions and initiating voluntary verbal or muscular action. Or alternatively we may idly dream or imaginatively rise to creative heights or sink to degrading depths as we will. This is the only mental body which sleeps. It is the one in which we pay attention to signals arriving from some external source, or to internal complaints of pain or hunger. Or in it, we are absent-mindedly preoccupied with problems or plans, and wholly inattentive to what goes on about us. These facts we have all observed but they must be set down to distinguishing the functions involved. The position of this body is localized by brain operations, animal experimentation and fatigue complaints at a point back of and above the eyes. It is a crossroads center drawing its signals over bundles of nerve fibers from both the cerebral cortex and the inner autonomic bodies.

The great outer mental body (cerebral cortex) distinguishes man, for it is the repository for voluminous learned wisdom and skills. Learned language, stored in its visual and audio areas, has been a tool of inestimable value in expressing, transmitting and storing our wisdom. Other learned symbols, shapes and sounds are useful in voluntary thinking but the bulk of the signals transmitted back and forth between the conscious center and this great warehouse are expressed in learned language.

For the means of expression of the inner mental bodies, however, we must dig back among those which are so commonplace that we take them entirely for granted. Reports of internal physical environment, the status of our reserves, which are a subordinate responsibility of the autonomic system, are sensed as hunger, nervous fatigue, exhaustion, or as satiety, enthusiasm, exuberance, etc.

ALL of the external receiving senses bring their wave receptions through the autonomic inner brain for a preliminary appraisal. At this time there is a tentative evaluation of urgency which may result in an involuntary scream, a frown or expression of surprise.

If the urgency seems sufficient, the conscious center will receive and sense a signal diverting its attention to the problem. (The initial reception goes on to cerebral cortex for association with the learned meaning of the shape or form observed.) The instinctive "language" used in evaluating the current situation includes those signals recognized in a sense of approval, of danger, of sympathy, of horror, as well as a sense of beauty, of rhythm, of harmony, etc.

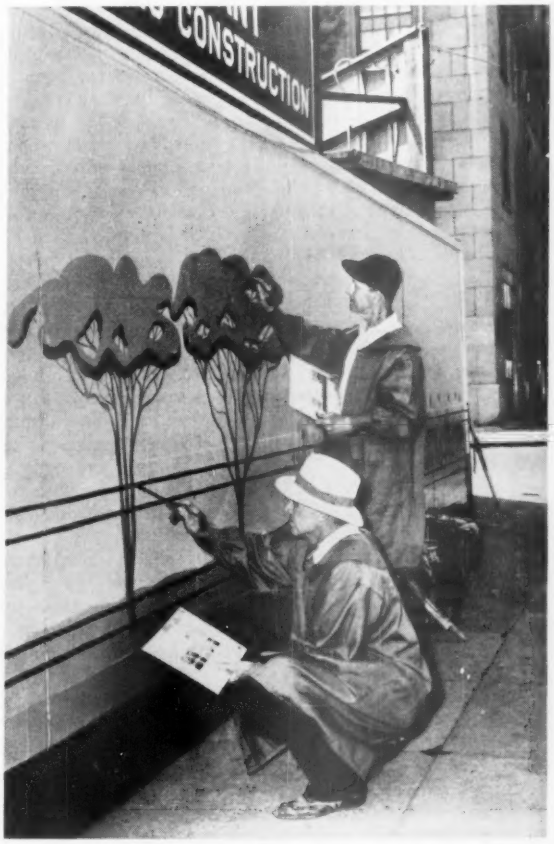
Evaluation of thoughts, in the process of constructive thinking, is another major service of the autonomic inner brain. Here, if we will take the time to "stop and think," to weigh our thoughts we may sense valuable appraisals. (But we, at the conscious center, must take care that we are not confused by learned misconceptions bobbing up subconsciously from cerebral cortex. This is intellectual integrity.) A sense of justice, of worth, of verity are among the commonly recognized expressions of the wordless autonomic communications in this process.

Even more striking is "the flash of an idea." Many professional men have learned by experience that successful organization of thought is not a conscious function, but actually requires the relaxation of conscious effort. The observation is as old as the ancient recommendation, "let's sleep on it." The process may be "taken for granted" or may actually be taught, as it is in modern research organizations.

First a voluntary effort must be made to gather the material to be evaluated. This effort must be thorough for the resultant thought or opinion can be no more thorough than the input data.

Then conscious effort must be stopped either in relaxation or sleep to permit the autonomic evaluating and resultant growth of an idea. Many men keep a pad in their pocket or beside their bed to set down the results. One notes that we sense the idea and recognize its meaning, but time is required to find suitable words to express it. However complex it might be, it arrived in that intangible but remarkable language which antedates learned language.

The autonomic evaluating and weighing processes are usually described as judgment, discretion, common sense and conscience. It is interesting to speculate upon what sort of wisdom must be stored in the autonomic brain cells to endow these gifts. "Speculate" is too loose a word



Artists in smocks add bright finishing touches on a block-long mural painted on a fence guarding the construction site of the new Seagram Building in New York City. The author says that such getting-along-with-people activities add to engineering as well as to life itself.

however, for the accumulated evidence is reasonably clear. These things are definitely not "learned" but would be called instinctive by the psychologist or "God-given" by the theologian. As talents, they vary much as physical proportions vary. Whether "we" at the conscious command post, consider and use them is another matter. "Snap-judgment," the unevaluated use of learned routines, is quicker and easier.

Autonomic motor neurons activate both physical and mental procedures. In the physical province they adjust heart action, lung action and the accumulation and dispensing of reserves for both physical and mental activities. These mental stimuli include the instinctive drives. Thus inquisitive curiosity, the urge to learn, is a more or less evident asset from the cradle to the grave. The reproductive urge, which is responsible for all of life, directs the successive steps of natural mating procedure beginning in adolescence. An urge to courageous adventure, powered by adrenal adequacy, may find outlet in athletics, exploration, building great bridges or industrial empires. Whether recognized or not, an urge to service beyond self, and a sense of mutual responsibility before God is inherent in man. The drive provides a motive power and assurance which may be used well or neglected.

INFORMATIONAL neurons of the autonomic evaluating services provide instinctive standards for weighing the relative requirements of growth, and of the maintenance of health and of activity. We take for granted that weighing of circumstances which so precisely adjusts nervous tension and the forces involved in our every action. Similar standards are basic to a sense of beauty, a sense of urgency, a sense of common decency, or a sense of justice.

The sense of decency, and the sensing of what is right and worthy bring us back to the dual role of the mental bodies which store learned and unlearned wisdom respectively. We store in cerebral cortex an acquired code of behavior which may be good or confused or positively bad. Split-personality victims suffer severe conflict at the conscious center, between their acquired behavioral habits and the censuring evaluations of conscience, based upon the instinctive standards. God said, "I will put my law in their inward parts," (Jeremiah 31:33), and it would now seem that we can see how it was done. The laws of human behavior, engraved as behavioral standards upon autonomic cells at the heart of the brain, have been sensed with substantially identical meaning since time immemorial. In widely separated lands and times men have taught "what they felt was right," expressed as similar laws and codes. To be sure voluntary rationalization has been at liberty to oppose the standards, with resultant autonomic repercussions, ever since self-determination first met the temptations of selfishness.

The internal executive responsibility of the mental body in which self, the conscious command, resides, is a primary concern in the problems of human engineering. Will power, self-control, mental hygiene and self-determination are the commonplace descriptions of this responsibility.

Obvious! But the relations to it of the two major collaborating bodies, the dual services, must be clear.

Review first the cerebral cortex and its storage of our acquired wisdom and habits. This large outer mental body is subordinate to our conscious control, at least in so far as we exercise our choice of what we wish to learn or not to learn. Its motor neurons can be directed to subconsciously control a practiced routine while conscious attention turns elsewhere. Thus one may shave, or drive, or recite the Lord's Prayer subconsciously, while planning the day's activity.

Engineers should be wary of thus doing two things at once, for the conscious line of thought is likely to send a partial stimulation to some muscle or cell involved in the subconscious routine and cause a mistake. Accidents and errors will result, to our chagrin or physical damage. Despite the pressure of modern business, the engineer does well to learn to pay full attention to one thing at a time.

Mental hygiene is the control that we should exercise to eliminate detrimental habits of thinking which we learn perhaps unintentionally. Mental diseases, neuroses, complexes are such learned routines which result in nervous or physical damage, to the detriment of the engineer or his personnel. Rabble rousing misguidance and imaginatively reiterated gripes, envies and worries establish subconscious routines which bob up repeatedly to cause maladjusted decisions or damaged health.

THE psychosomatic sequence of mentally induced physical disability involves the collaboration of all of the mental bodies. Battle-fatigue research findings apply equally well to the stresses of industrial life. To suit the urgency of the consciously observed situation, autonomic adjustments send hormones scurrying from pituitary, adrenal and thyroid glands. These increase heart and lung action and raise the nervous tension, literally the voltage of the neural system to provide the energy needed for contemplated action. At the same time a signal to the pancreas to restrain the heavy demands of digestive activity may be recognized in that sinking feeling or "butterflies" at the stomach associated with fear or apprehension.

Many men in war and in industry suffer battle fatigue from too many combat operations in rapid succession. Literally this is an exhaustion of the limited hormone reserves. It is nervous exhaustion! And as these same hormone functions maintain healthy operation of the physical system, their inadequate supply results in heart troubles, circulatory ailments, ulcers, digestive difficulties, etc. The antidote is rest, relaxation, time to replenish these vital reserves. The executive should note that as men get older, the replenishing process is slower. It takes more time to rebuild the reserve supply!

But many men suffered battle fatigue without ever getting into combat! The symptoms were the same. What happened? Their voluntary imagination pictured battle conditions so vividly that the evaluating capacity was misled into calling for an expending of reserves to meet the fictional situation as presented to it. Repetition of the process exhausted the reserves as effectively as actual combat, and with the same results.

In normal living, personality clashes, blood-and-thunder fiction, fancied wrongs and self-pampering fear or worry routines all add to the usual demands of industrial accomplishment in draining the reserves. With my angina it is easy to note the increased pressures when I am plunged into a difficult problem, or disturbed by personnel problems or even when listening to a tense radio drama.

The energy demands of arduous mental effort have been shown to be as fatiguing as athletic competition. The stresses of engineering and executive responsibility are enough by themselves. The further stress of a dangerous process, security worries, a high noise level, frequent interruption or an obnoxious executive just increase the demand. In his work the engineer must recognize and cope with these routine problems of human engineering.

These we have listed as the third and fourth levels of thinking. Both of them go beyond the attentive application of the prescribed routines or prefabricated solutions of learned wisdom. Both are essential to worthwhile engineering.

Constructive thinking requires the autonomic evaluations of judgment in the selective organizing of pertinent material which has been voluntarily gathered. The initiating drives of inquisitive curiosity and the urge to accomplishment are necessary catalysts. The God-given standards participate in intellectual integrity which is a little-mentioned secret ingredient of sound thinking. The input data must be carefully scrutinized. Preconceived notions which might bias the weighing process, must not be admitted in evidence.

The need for brief or extended relaxation of conscious effort to permit formulation of the resultant idea was discussed in considering evaluation and judgment.

THE fourth level, creative thinking, goes beyond the range of normal expectancy based upon experience and available data. It involves the concept of inspiration, the religious concept of guidance by God's infinite wisdom. It raises the question whether we, as engineers, shall be bound by materialistic cries of "superstition" and "speculation." Or shall we consider the testimony of spiritual leaders and the convictions of such creative scientists as Edison, Carver, and Steinmetz.

Obviously, either we may choose to deny God or we may see in Him an intangible integration of power, wisdom and responsibility. Consider the electrical intangibility of thought storage, data coordination and wave transmission, all of which has its parallels in the experience of engineers.

Beyond that, if we assume there is no God, then self is supreme. It is subject to no higher responsibility and to no appeal for help when it reaches an impasse beyond self's own powers. For a while it rides high on self-centered egotism (egomania). Later it slips off into other maladjusted or diseased subconscious routines. Frightened inferiority complexes (egophobia), the conflicts of split personality (schizophrenia) and depression psychoses. These are afflictions of inadequate faith and of unbalanced use of the mental bodies.

My own long and discouraging bout with nervous fatigue, worry, stomach disorders and glaucoma climaxed eleven years ago when there was finally no place left for me to turn except to God. My casual acceptance of religion at the time was definitely not equal to the task.

An acquaintance, with adequate faith, persuaded me of the reality of the fundamentals which religion teaches. The subsequent return to confidence and health cleared the way to undertake engineering problems which had seemed impossible before.

When George Washington Carver outlined his problems in prayer, he sensed answers to them. As an engineer, that was hard for me to believe, until I tried living according to the rules and found out by experience that prayer is answered! It may or may not be at once. It must be a proper and unselfish request. It must be honestly formulated and with due diligence.

Yes, those are the time honored rules, but even so how can it be? The pineal body of the inner brain was singled out by Descartes as man's point of contact with God. Its structure identifies it as a receptor organ. Nerve specializations for various wave length receptions have already been noted. Being in the autonomic system its sensed receptions are not in learned language. Like the flash of an idea they are recognized and then put into words.

Those engineers who have not yet attained to the conviction of spiritual maturity do well to seek it. The glitter of our shiny new bits of scientific wisdom do dazzle us. But scattered through the rubble of ages of religious experience are gems of great worth. And the value of such bits of wisdom is in their use.

The contributions of the four levels of thinking are cumulative. Subconsciously stored engineering education and experience are essential. Consciously attentive manipulation thereof will carry a man through routine problems. But in many instances he must go on to think for himself. At the third level, autonomic drives and the evaluating assets make possible his constructive thinking. The fourth level, prayerful attunement with God's unity of system and infinite wisdom, carries him beyond normal expectancy to the potentials of inspiration.

Mental effectiveness in engineering services requires the best use of all of these. Either they may be carelessly taken for granted, or their utility may be fully developed and maintained.

A RIGID conscious policing of subordinate habits of thinking cannot be overemphasized. Neurotic suspicions, worries and greeds are rudimentary mental diseases to be purged. Self-pampering, self-aggrandizing and generally self-centered habits of thinking are related routines of the maladjusted self. In the instinctive balancing of internal replenishments (self-preservation) and the expending of reserves to power external services, nature gives precedence to the services outside of self. Christ's emphasis upon the unselfish point of view throughout His teachings emphasizes the positive side of mental hygiene. Rigid integrity, internally (and externally) is also basic to the well kept thinking habits which provide peace of mind.

Physical effectiveness requires the exercise of good judgment. As the engineer matures to executive and consulting responsibility he will find that physical and nervous reserves do not rebuild as rapidly as they did in earlier days. The energy peak is around eighteen or twenty years of age and diminishes gradually as the decades roll by. A falsely high nervous tension may be maintained for a while in emergencies. But the letdown due to exhausted reserves becomes apparent in nervous breakdown, heart troubles and digestive disturbances. It is better to plan increasing relaxation periods to favor this slower replenishment of reserves.

Spiritual hygiene replenishes faith, confidence, courage and God's good gifts of the higher levels. We are too inclined to take such things for granted until, in the depths of discouragement, they are gone. Don't neglect the spiritual rebuilding services of the weekly sermon. But even that can be ineffective without the voluntary will to get into the spirit of the Sabbath.

The law of survival of the fit emphasizes the demand for responsible accomplishment, or else! Christ's parables drive home the same lesson repeatedly. Psychosomatic retribution or reward are demonstrated in mental conflict

(*Continued on page* 47)

About the Author . . .

Mr. Crane

Edward V. Crane is a graduate of Yale University's Sheffield Scientific School, with the degrees Ph. B. and M.E. He joined the E. W. Bliss Company in 1920, and has devoted 25 years of his professional career to that firm's products and services. During World War II he served as vice president in charge of mechanical engineering for Sam Tour & Company, a research and engineering organization. Later, he was chief engineer of the Hydraulic Press Manufacturing Company. He returned to Bliss in 1950, and is currently director of research for the firm at Canton, Ohio. In this work he and his staff have been involved in the development of the 25,000 and 35,000-ton forging presses for the Air Force. Mr. Crane is the author of "Plastic Working of Metals," and has contributed extensively to technical publications and engineering handbooks. One of his favorite spare time interests is a study of the human brain, its parts and their functions.

How the Texas SPE Works with the Lone Star State Legislature

By FREDERIK B. ISELY,

Legislative Consultant, Texas Society of Professional Engineers

THE Lone Star State of Texas has some 650 local, as opposed to statewide, laws on the statute books regulating the taking of game and fish. And it is well known in legislative circles that a member of the House or Senate gives as much study to each game bill he is requested to sponsor as he does to the weightiest appropriation bill. Many a statesman, real or incipient, has been rolled down the hill in defeat because he innocently introduced and supported a squirrel law that offended his East Texas constituents.

These "little local bills"—as the legislators call them—can cause headaches for people other than lawmakers, and the Texas Society of Professional Engineers had an interesting experience with one in the 54th Legislature which met in 1955.

It is heartening to note that the local bill—which aimed at the heart of the State's Engineering Registration Act—did not pass. Of perhaps still greater significance is the fact that the Society's members and officers accomplished its defeat in a manner so gracious that its public relations with the lawmakers was vastly improved. So much improved, in fact, that high hopes are now held for the accomplishment in 1957 of what could not be accomplished in 1955 because of the little local bill.

For one thing, the Society accumulated new and powerful friends in the Legislature, including four members who now are referred to as the Four Horsemen who saved the day for the engineers. They are Representatives John Blaine of El Paso and Robert R. Patterson of Snyder, and Senators George Parkhouse of Dallas and W. S. Fly of Victoria.

The story of what happened can best be introduced in terms of what the Society had hoped to accomplish.

It foresaw no major legislative battle on the horizon, and thus prepared some significant amendments to the Engineering Registration Act. The general purpose of these amendments was to strengthen the Act by clearing up certain ambiguities in the existing law. The merits of these amendments had been carefully explained to many legislators, and with Representatives Blaine and Patterson ready to fight for them in the House, and Senators Fly and Parkhouse poised to take up the battle in the Senate, no considerable opposition was expected.

But down in Fort Bend County a storm not detected on the engineers' radar was simmering. In December of 1954, one month before the Legislature convened, the Society's Registration Enforcement Committee had gone to court and won a declaratory judgement in a case involving the County Commissioners' Court, the governing body of the Fort Bend County Drainage District. The latter, in the course of planning and installing certain public improvements costing an estimated $240,000, had engaged the services of a contracting firm, neither of whose two members was a registered professional engineer.

THE work in question involved "public health, welfare and safety" and hence should have been planned and carried out only by registered professional engineers, and hence the instigation of the suit.

But the court action obviously left some bitterness, for one of the first bills introduced in the legislative session the following month was one by Representative J. F. Ward of Fort Bend County to exempt from the provisions of the Engineers' Registration Act those contractors or others who had been engaged to do engineering work by county commissioners courts in Texas.

Representative Ward's bill met instant favor, and other House members added to its potency by tacking on other amendments which further weakened the Registration Act. In the matter of a few days, it began to appear that

Representative John E. Blaine El Paso, Texas

Senator William S. Fly Victoria, Texas

Representative Robert R. Patterson Snyder, Texas

Senator George Parkhouse Dallas, Texas

Representative Ward would not only win this fight, but the Texas Society of Professional Engineers would have no Registration Act worth mentioning left intact by the session's end.

It was time for engineers to get mad. Sensing this, the Society's president, J. S. Hudnall of Tyler, sent out a letter telling them not to do it. This was no time for short tempers, the president said. He added that if the Registration Act were to be saved a terrific legislative educational job would have to be performed, and he called on all hands to do their part.

Meanwhile Representatives Blaine and Patterson, the spearheads in the House who were to introduce and fight for the amendments to the original Act, shifted their fire to the other front to defeat the Fort Bend County measure.

Blaine, a former executive with the Texas Power and Light Company in Dallas, but now a bond broker in the desert capital of El Paso, has always had an interest in the professional development of the engineering fraternity. In particular, he is a powerful exponent of water conservation and the utilization of engineering talents in that field. Representative Patterson of Snyder, keen-minded lawyer, knew relatively little of the problems of engineers when the session opened, but within thirty-six hours after a delegation of engineers had explained the legal technicalities they faced, his knife-blade mind had so penetrated to the core of the issue that he was lecturing the engineers on the problems of their profession.

But despite their active opposition to the Fort Bend County measure, these good men lost their fight in the House. The scene of action then shifted to the Senate.

THE engineers' friends there were waiting for it. Senator Parkhouse of Dallas, an outdoor advertising company executive in private life, has devoted much of his public life, as a veteran member of both House and Senate, to the improvement of the engineering profession, and is at present chairman of the Legislative Water Resources Committee which is drafting remedial laws in this field for presentation to the Legislature next year. Senator Fly of Victoria, a successful lawyer and one of the Senate's floor leaders last session, has had a wide experience before the bar handling cases involving engineers and contractors.

As soon as the Fort Bend County bill reached the Senate it was referred to the Committee on State Affairs, of which Senator Parkhouse was a member. The bill was killed there. It wasn't even brought up for discussion.

It took much longer to safeguard the Registration Act than might be supposed. The contest went on for weeks and weeks.

Meanwhile, what had happened to the amendments to the Registration Act that the Society so hopefully looked forward to seeing enacted?

So much time had been lost in beating off the Fort Bend County bill that the Society amendments were not introduced until the last minute of the last day on which bills are permitted to be dumped in the hopper.

And it was introduced then mainly as an education effort, with no hope of any action transpiring that session.

Apparently, the educational effort paid off—because of the manner in which the proposed amendments were presented to the legislators.

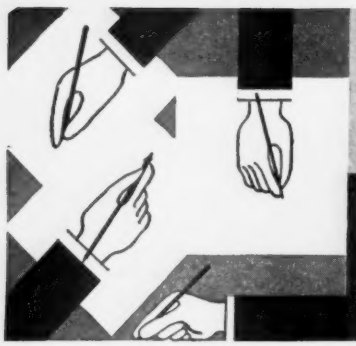
Rather than introduce a huge document calling for the substitution of this word for that and this section for that, the engineers prepared a whole new bill, with all of the suggested alterations, whether a word or a sentence or a half sentence or a section, printed in red ink.

The legislators were so impressed with the simplicity and effectiveness of the manner of presentation that the Society's executive secretary in Austin, Henry Harkleroad, received scores of congratulatory letters from the lawmakers. Harkleroad, in answering these letters, reminded the writers that the bill embodying the amendments would be introduced again in 1957.

In all of the turmoil over the Fort Bend County bill, no animosities were aroused. It is doubtful if even Representative Ward, author of the bill, ever was actually hostile to the engineering profession as such, and he was certainly courteous and gentlemanly with the engineers who approached him to discuss his proposed legislation.

The Texas Society believes that in all of the hullaballoo of the last session it actually made friends instead of losing them. It will operate on that belief in 1957, and will continue to cultivate the legislative relationships so vital to the existence of a professional society. If it can keep the friendship of the Four Horsemen—Blaine, Patterson, Fly and Parkhouse—and add to this quartet other legislative members as sharp-minded and progressive, the Texas Society cannot help but achieve its goal of a strengthened Registration Act.—***End.***

NSPE'S EXECUTIVE COMMITTEE met for the first time July 20-21 in the Conference Room in the new National Society headquarters building in Washington, D. C. In the busy sessions during the two-day meeting, the Committee covered a wide range of NSPE topics. Among those extensively discussed were the development of programs for young engineers, public relations, membership programs, and functional sections. Seated from left to right around the conference table are: Allison C. Neff, past president; Allan H. Kidder, vice president; Harry G. Kennedy, vice president; Russell B. Allen, treasurer; R. J. Rhinehart, president; Paul H. Robbins, executive director; Clark A. Dunn, vice president; Warner Howe, vice president; and Garvin H. Dyer, vice president.



Professional POSTSCRIPTS

Our —PP— this month was sent to us from Engineer A. C. Kirkwood, consulting engineer of Kansas City, Mo. It is an editorial from the Kansas City *Star* and is entitled "The Scientific Sweepstakes." Of it Engineer Kirkwood says, "The actual and comparative shortages of engineers and scientists (is) set forth very clearly." We agree and so here is the *Star* piece.

—PP—

On his long climb from cave to laboratory man has reached a peak. Mid-20th Century is the starting point of the greatest of scientific revolutions, a period in which natural laws and unnatural machines are being coupled to create a new world.

Progress dramatizes the change. Thirty years ago television was only a test pattern in the eyes of a few. The propellerless airplane was science fiction, atomic energy was theory.

We have not moved forward alone. Scientists elsewhere, particularly in Russia, have kept pace. There, for example, visitors recently inspected—from a distance—a new synchroton for high energy research, a machine which one English scientist said would give Russia a world lead in that field.

So science becomes a point of orientation for world struggle, key to survival and key to peace. To put the atom to practical use, to tap the energy of the sun, to distill sea water—these are goals which in the next century may strengthen the hand of East or West and may save have-not nations from extinction.

The chief weapon is the scientific brain. Russia realizes this and has taken tremendous strides in production of scientists and engineers. By contrast we have slipped backward. Dean John R. Dunning of the Columbia University School of Engineering says "already we have lost the battle of engineering manpower—at least in numbers."

Allen W. Dulles of our Central Intelligence Agency cites these numbers. In this decade Russia will graduate 1,200,000 in the sciences while the U. S. will graduate 900,000.

To Dr. Alan T. Waterman of the National Science Foundation this means one thing: "A crisis in science education." Others have joined him in examining the success of the Soviet program and the reasons ours has faltered. Their first conclusion is to dispense with the false comfort of considering Russian scientists inferior to ours. That is mere wishful mythology.

Russia has organized a huge education machine to turn out technicians. This year the U. S. graduated 23,000 engineers with B. S. degrees; Russia gave comparable certificates to 63,000. (Their population is one-fourth larger than ours.) It is small consolation that we produce educated individuals while the Soviet developed only educated state servants.

The Russian setup consists of a 10-grade compulsory general education school comparable to our grade and high schools, followed by five years in higher education establishments, such as the huge University of Moscow.

If the child is scientifically inclined, there is no question of his future. State stipends and general deferment from the draft are inducements to better grades throughout scientific training. Such rewards are not common in other fields. The graduate is a capable scientist but lacking in a background in the humanities. Emphasis is placed, however, on foreign languages, particularly English.

Students report Russian science is weak only in biology where it has been hampered until recently by Marxism. There is great emphasis on scientific teaching with almost 50 per cent of technical students channeled into classrooms. Only 35 per cent of our scientists are engaged in teaching and research at educational institutions.

Where does this leave the U. S.? At the moment our position is not encouraging. We are not producing enough scientists and engineers.

One reason has been the law of supply and demand. In 1949 we graduated 50,000 engineers and many had trouble finding jobs. Fewer technical positions were available, so the number of students in those fields decreased. There now is an upturn in response to the new demand, but not enough to meet long-term needs.

On another level we have failed to make teaching sufficiently attractive to lure the scientifically-minded from the rewards of industry. The number of graduates who completed requirements to teach high school science decreased from 9,100 in 1950 to 3,800 last year. Thus others must step out of their fields and instruct in mathematics or science. A Princeton survey shows that four-fifths of the math teachers are not competent in the subject.

Math enters the picture in another way. Woefully it appears to be a vanishing American. Invariably it is voted the most unpopular of school subjects—"Too hard" or "too dull." Students avoid it, partly due to an impression of some parents that math is strictly for the egg-heads. Only half the nation's high schools offer physics or chemistry, 23 per cent neither. Less than a quarter of our high school students study even elementary algebra.

These are the facts that worry our educators and government alike. For the short-range problem—finding scientists and engineers for immediate needs—the law of supply and demand is on our side. Active recruiting by industry is helping. Some companies have even placed "Help Wanted: Scientists" ads in British newspapers.

Local programs should have a big effect. For example, Southeast High School this year exposed more students to the scientific world through outside speakers. The Wyandotte High School Science Field Club has been a pioneer. And nation-wide science fairs are important.

On a national level, government

AUGUST MEETINGS Of Note

Society of Automotive Engineers — West Coast Meeting, August 6-8, Mark Hopkins Hotel, San Francisco, California.

Western Electronics Show and Convention — Annual Convention, August 21-24, Pan Pacific Auditorium, Los Angeles, California.

National Council of State Boards of Engineering Examiners — Annual Meeting, August 23-25, Hotel Statler, Los Angeles, California.

can but point the direction. It would be conceivable for it to take over the educational system and produce technologists on a compulsory basis. But that would destroy the concept of local control. Only with caution can there be outright aid.

The National Science Foundation in 1953 inaugurated a series of summer institutes for high school and college science teachers, offering an opportunity of contact with first-rate minds. Traveling high school science libraries bring technical volumes to scattered areas.

Some believe the Federal Government should go further. A bill in the Senate would increase to $25,000,000 the scholarship program of the National Science Foundation. Most educators hope, however, that extensive scholarship efforts will be carried on by private interests.

In attacking the problem, industrialists, educators and government officials agree we must never forget other fields of learning. Samuel M. Brownell, U. S. Commissioner of Education, has pointed out that it is unwise to rob the potential of diplomacy, law or economics, for example, to produce more scientists. And at the same time we must never lose sight of the ideal that scientific training in a free land necessitates a firm grounding in the humanities.

At mid-century, then, this is a challenge America must meet in answering the onslaught of communism. Russia has embraced the Baconian edict that "Knowledge is power." To the Soviet that means scientific knowledge. Our answer is brain power. With the proper education, it will be sufficient.

Unpaid Dues Requested By President Rhinehart

NSPE members who neglected to pay their 1955 dues were recently asked in a letter by National Society President Robert J. Rhinehart to forward the delinquent dues or be dropped from the membership.

Stating that the letter was one of his first projects since taking over the NSPE presidency, Mr. Rhinehart pointed out that the full support of the 38,000 member Society is needed. "With the aid of all of our members we cannot fail to achieve progress in the advancement and welfare of the professional engineers of this nation," he stated in the letter.

Mr. Rhinehart also invited comments from delinquent members so that they might be fully advised on NSPE activities before discontinuing their affiliation.

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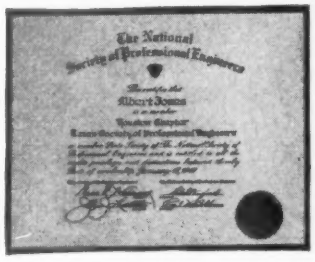

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AN INFORMED MEMBERSHIP

BY PAUL H. ROBBINS, P.E.

Executive Director

N.S.P.E.

NSPE believes that an informed membership given as complete information as possible on any particular subject will by majority decision arrive at a policy for the Society which in the long run will be best for the engineering profession. This is not to say, of course, that there will not be differences of opinion. NSPE further believes that there should be every opportunity for these differences of opinion, not only to be presented, but to be considered carefully by all those on whom policy decisions may rest.

These philosophies are evident in many aspects of the Society's activities. It is, of course, very fundamental in the three-level structure of the Society where the majority of opinion of the members of a particular chapter governs the position of that chapter's representatives on the state board of directors, and where the majority of opinion at the state level is carried forward to the national directors by the state representatives. This representative form of administration of the professional society places, of course, increased responsibility on each level of member representation.

NSPE believes also that every member should have the right of expressing his opinion to each level of the Society at which policy considerations are concerned. The broader the expression of such opinion, the more representative the resulting policy will be. To be effective, of course, these philosophies place responsibilities upon the Society to keep the membership informed and upon membership to avail itself of all means possible to obtain the complete story on various elements of professional policy.

The Society uses a number of means of informing the membership. Of course, the primary means by which each member follows the activities of his professional society is our monthly publication, the AMERICAN ENGINEER. The magazine contains regular features of information such as the "From Washington" column and the "Engineering Employment Practices Digest," but perhaps most important is the increasingly complete coverage of the meetings of the National Society, an example of which was contained in the July issue reporting of the Atlantic City meeting. A number of excellent committee reports were presented at this meeting, and each member would do well to read this report carefully to keep himself informed on important national developments.

In addition, of course, those members who desire may receive the *Legislative Bulletin* and the *Engineering Employment Practices Newsletter* by merely requesting that their names be added to the mailing list for these publications.

From time to time the Society publishes special publications dealing either with a specific topic or a round-up of developments in the professional area. The Annual Report sent each year to the entire membership is one means of putting in perspective the year's activities of the National Society.

A recent publication, titled *Professional Policies*, appears to be of considerable interest to membership since it tabulates the major policies with respect to professional activities which have been considered and on which policies have been adopted by NSPE.

While publications are the most extensively used means of extending to membership as much information as possible, there are other means which are perhaps even more effective. We all recognize the value of hearing someone well informed on a subject, particularly if we have an opportunity to ask questions or participate in a panel discussion of the subject. This provides an opportunity for clarification of the issues far more effective than a written presentation. Many opportunities are provided members of NSPE to participate in such discussions when chapter meetings are held, national officers visit the area, or the state's national director speaks at a chapter meeting. The degree to which an ultimate policy with respect to professional matters may represent the wishes of the membership is to a degree proportional to the participation of the membership in the discussions which precede the policy determination.

NSPE firmly believes that the direction of the Society and the determination of professional policy should not descend from or be based on the thoughts of a few of the leaders. NSPE takes pride in being a grass-roots organization. The increasing growth of the tree and its ultimate ability to bear more and more fruit depends directly on the strength of its grass-roots structure. The ability of NSPE to produce the fruit of professional status and increased prestige for the engineering profession depends entirely on the extent of participation and strength generated from the grass roots.—***End.***

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With Our Members . . .

Lively Panel Discussion

California Society Has Varied Program At Recent Annual Meeting In Modesto

Installation of officers, a lively panel discussion and significant addresses highlighted the recent annual meeting of the California SPE held in Modesto. NSPE President Robert J. Rhinehart delivered the principal address at the annual banquet, speaking on "Today's Professional Engineer."

Honored at the banquet were the past presidents of the Society who were presented with plaques by past National Director Oliver Deatsch, general chairman of the convention committee. Those given plaques were A. C. Bullen, Sr., C. D. Allen, George Zelhart, W. W. Holden and Fred Johnson.

President Rhinehart installed Paul V. Birmingham, newly elected state president, and his staff of officers, which included W. Samuel Belden, first vice president; Kirkendall Carlton, second vice president; Alvin S. Issacs, third vice president; Hugh B. Brewster, treasurer; John A. Contheimer, secretary and executive secretary, and George Zelhart, national director.

National Director Zelhart was the moderator of a panel discussion which included the following participants: Robert J. Rhinehart, division superintendent, Arkansas Power & Light, "Engineers in Utilities"; Charles H. Sorter, manager, Laval Underground Surveys, "Engineers in Industry"; Edwin F. Sullivan, chief, Fresno Operation Branch, Bureau of Reclamation, "Engineers in Government"; Robert J. Parden, dean, College of Engineering, Santa Clara University, "Engineers in Education"; and John Sardis, structural engineer, San Francisco, "Engineers in Private Practice."

The ladies program consisted of several luncheons and tours of various industries and plants.

Among the social activities in the lighter vein was an old fashioned strawberry social with entertainment, singing and dancing. The Stanislaus Chapter served as hosts under the leadership of President Homer Jorgensen.

"Gust" Karlsteen Given State Service Award

The Distinguished Service Award of the New York State SPE was recently presented to Gustave H. Karlsteen.

A tireless worker for his Erie County Chapter, Mr. Karlsteen has also served the NYSSPE as chairman of several committees, and is currently a member of the National Defense Committee for the National Society.

Vincent G. Terenzio, who made the presentation, cited "Gust" as having a "record which should be the envy of every sincere professional, marking as it does—brilliance in study, bold striving for improvement, attainment of high responsibility, valuable contributions to technology and genuine concern for the welfare of others."

Primm Elected Prexy Of Wisconsin Chapter

John K. Primm, Manitowoc, was elected president of the Fox River Valley Chapter of the Wisconsin SPE during the annual meeting in June.

Other officers include John R. Egan, Oshkosh, vice president; James Zimmerman, Appleton, secretary-treasurer; and Robert W. Frazier, Oshkosh, George H. Hall, Marinette, and William E. Raffin, Appleton, directors.

The Chapter, which includes more than two hundred members in thirteen counties, is the oldest organization of its kind in Wisconsin.

"Trick Lighting" Subject At Knoxville Meeting

"Trick Lighting" was demonstrated and discussed at a recent meeting of the Knoxville Chapter of the Tennessee SPE.

The meeting consisted of a special non-technical program for "Ladies Night" and featured the lighting talk by Judd Lough, district manager of the Holophane Company, Atlanta, Georgia. He is president of the Illuminating Engineers Society of Georgia.

Traffic Engineering Discussed In Texas

Paul W. Rice, a member of NSPE, was the featured speaker at the July meeting of the Nueces Chapter of the Texas SPE.

Mr. Rice, director of engineering in Corpus Christi, spoke on traffic engineering as a profession and traffic problems in Corpus Christi. A question and answer session followed.

Annual California Meeting

Shown at the recent annual meeting of the California SPE are, l. to r.: Paul V. Birmingham, newly-installed state president; Robert J. Rhinehart, NSPE president; Fred Johnson, retiring state president; Jack Sontheimer, secretary; Oliver Deatsch, past national director and general chairman for the meeting, and Kenneth Biesiemeier, retiring treasurer.

E. M. Gilbert Honored By Reading Chapter As "Engineer of the Year"

Members of the Reading Chapter of the Pennsylvania SPE recently bestowed their highest honor—"Engineer of the Year"—upon Ernest M. Gilbert, 82, founder of the international engineering firm bearing his name.

"Ernest M. Gilbert has been an inspiration to engineers and his accomplishments are truly milestones in the progress of electricity," said Harry Potteiger, president of the Reading Chapter. "Those of us fortunate enough to have been associated with him have gained immeasurably by that association. We are proud to add 'Engineer of the Year' to his many honors."

A 1895 mechanical engineering graduate of Cornell University, Mr. Gilbert has earned the title of "Power Pioneer" for his part in the development of steam generation.

As a testimonial to his engineering ability, the Gilbert Generating station of the New Jersey Power and Light Company, Holland, N.J., bears his name. This was the first plant in the United States using pulverized coal as a fuel.

Mr. Gilbert is a member of NSPE.

In addition to the "Engineer of the Year" award, the Wyomissing Polytecnic Institute was presented an award for their assistance in providing facilities for conducting engineers-in-training classes.

To climax the meeting Norman V. Peterson, president of the American Astronautical Society and a research engineer for the Sperry Gyroscope Company, New York, discussed the country's satellite program. His talk was illustrated with slides.

Ernest M. Gilbert, seated at the left, receives the 1956 Engineer of the Year award from Harry E. Potteiger, president of the Reading Chapter. Others are, from l. to r.: T. Glenwood Stoudt, president of Wyomissing Polytechnic Institute; John W. Bowman, chairman of the board, Wyomissing Polytechnic Institute; and Russell W. Ingham, president of the Reading Affiliate Group.

Texas SPE Announces Rev. Merritt As Chaplain

The Texas SPE has an official chaplain in the person of the Reverend Warren F. Merritt, rector of St. Philip's Episcopal Church, Hearne, Texas—and he is a registered professional engineer as well.

J. B. Dannenbaum, president of the Texas SPE, reports that Rev. Merritt has been most active in his section of the state on behalf of both the State Society and NSPE. Rev. Merritt relinquished his membership in the Texas SPE after he was ordained.

New York State SPE Plans Sept. Meeting

The autumn meeting of the New York State SPE will be held in Binghamton at the Arlington Hotel, September 20-22.

The Broome Area Chapter of the Society will be the host. James P. Peterson, president of the Chapter, has announced appointments of the following committe chairmen for the meeting: William W. Perry, Binghamton, general chairman; Lloyd D. Armstrong, Vestal, publicity committee; Robert J. Martin, Binghamton, transportation; George W. Peterman, Binghamton, entertainment, and Donald Purdy, Binghamton, speakers committee.

Since it was founded in 1926, the New York Society has grown into an organization of twenty-seven chapters and 4,400 members.

Annual Woodward Banquet

Among the guests at the banquet were, l. to r.: S. R. Beitler, P.E.; William Rohr, P.E.; the Rt. Rev. Msgr. N. H. Wegner, director Boys Town; Oscar G. Burch, vice president of engineering and research, Owens-Illinois; and Robert N. Waid, P.E.

The annual banquet of the Woodward Engineering Society was held recently in Toledo, Ohio, with honored business executives, educators and professional engineers present. A total of thirty colleges were represented by their deans or graduates.

The Woodward Engineering Society was organized in 1921.

Texas Chapters Hold Joint Meeting, Tour

A guided tour through the Alcoa Aluminum plant at Rockdale, Texas, an illustrated lecture on the plant, and a barbecue picnic supper were features of the July meeting of the Travis Chapter of the Texas SPE.

The meeting was a joint affair with the Brazos and Central Texas (Waco) Chapters also participating.

. . . more news on page 37

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Indiana SPE Makes Plans For Refresher Course

The Lafayette Chapter of the Indiana SPE and the Purdue Division of Technical Extension are making plans to conduct a refresher course for prospective registrants to the professional engineers examination in October.

A. V. Houghton, a member of the Lafayette Chapter, will be instructor for the course.

Former Michigan Head Ordained to Diaconate

A past president of the Michigan SPE, Arthur F. Plant, was recently ordained to the diaconate in the Episcopal Diocese of Michigan.

Extremely active in church affairs for many years, Mr. Plant has been treasurer, vestryman, junior and senior warden at St. James Church in Birmingham. In addition, he has served on various councils and been a delegate to all Diocesan Conventions since 1932.

He intends to become a candidate for the priesthood, but does not aspire to become the rector of a parish. He says he would like to remain at St. James as a deacon and serve wherever needed in the diocese.

A state director of MSPE, Mr. Plant has been associated with The Austin Company, engineers and builders, for the past thirty-seven years. He is manager of the Detroit office and a company director.

Discuss Possibility Of Maryland Chapter

Professional engineers in the Prince Georges-Montgomery County area of Maryland met in July to consider the possibility of establishing a chapter.

. . . more news on page 39

Participating in the annual meeting of the Maryland SPE were, l. to r.: Paul H. Robbins, NSPE executive secretary; Allison C. Neff, NSPE past president; R. B. Allen, NSPE treasurer; Ernest H. Hanhart, outgoing Maryland president, and Frank E. Winslow, incoming president.

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Restricted to Registered Professional Engineers . . . Directory Continued on Next Page

. . . more news on page 40

MICHIGAN OFFICERS—The Michigan Society of Professional Engineers' new state officers were inaugurated in a special function at the annual banquet, during the ninth MSPE convention held at the Detroit Leland Hotel. In an impressive ceremony before the entire member delegate body, L. J. Richards, MSPE past president, administered the oath of office to the incoming officers. Seated from l. to r. are Fred VonVoigtlander, first vice president, N. O. Saulter, 2nd vice president. (Standing left to right) Helmer A. Ronningen, treasurer, A. C. Friel, president, and Fred L. Hendrick, secretary.

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Georgia SPE Gives Plaque For Engineering Exhibit

At the second annual Muscogee School District Science Fair, the Columbus Chapter of the Georgia SPE recently presented a plaque to a high school senior for the "Outstanding Engineering Exhibit."

Kenneth Johnston, 18, a senior at Jordan High School won the plaque for his exhibit of an airplane jet engine with design also for use in an automobile. Three members of the Columbus Chapter—W. H. Raymond, Jr., Dixon Olive and Marion E. Brooks—assisted in the judging of the Science fair. Presentation of the plaque was made by Marion E. Brooks, president of the Chapter.

Subjects of exhibits were "Biological Sciences," "Physical Sciences," "Engineering" and "Public Welfare."

Marion E. Brooks, right, president of the Columbus Chapter, presents plaque to Kenneth Johnston for his "Outstanding Engineering Exhibit" at recent Science Fair.

Valley Forge Chapter Hears G.E. Speaker

At the June meeting of the Valley Forge Chapter of the Pennsylvania SPE, Frederic M. Cooper, propulsion engineer for the special defense projects department of the General Electric Company, was guest speaker.

Mr. Cooper, a licensed professional engineer in New York State and Pennsylvania, talked on General Electric's plans at Valley Forge in Montgomery County, Pa., and also about his company's decade of guided missile progress.

Explaining how the Philadelphia area was chosen over twenty other sites for the special defense projects department, Mr. Cooper said the central location and transportation facilities were the main reasons. He illustrated his talk with slides showing what the intended facilities would probably resemble.

As a result of guided missile work started in 1944, Mr. Cooper told in general terms how and why the special defense projects department was organized. Of the many defense projects being carried on by our Government, one of the most complex from a standpoint of engineering and science is the guided missile, he said.

The special defense projects department is one of a hundred separate departments of General Electric.

Topeka Chapter Elects Hultgren New President

Officers of the Topeka Chapter of the Kansas Engineering Society have been announced as follows:

Carl D. Hultgren, president; Harvey Leaver, vice president; Harry Hozle, secretary; Charles Stacy, assistant secretary; Walter Betterly, treasurer, and Paul Martin, director. Frank Virr and Jake Spiegel are continuing unexpired terms as director and state director respectively.

STRICTLY BUSINESS

Personalities . . . **Dr. Seymour Baron** has been promoted to technical director of the newly created Chemical and Nuclear Section of **Burns and Roe, Inc.,** New York, N. Y. . . . **Karl W. Galliger** has been appointed director of engineering of **The New York Air Brake Company.** . . . **Russel S. Bodwell** has joined the **Union Building & Construction Corporation,** Passaic, N. J., as assistant chief engineer. . . . **Ira J. (Ike) Kaar** has been elected to the new position of vice president and engineering director for **Hoffman Electronics Corporation,** Los Angeles, Calif., it has been announced by **H. Leslie Hoffman,** president. . . . The consulting engineering firm of **Michael Baker, Jr., Inc.,** has announced the appointment of three new vice presidents—**Don H. Graham, Wayne D. Meyers and Frederick H. Awalt.** . . . **L. R. Miller** has been named chief engineer for the **Trent Tube Company,** East Troy, Wis. . . . **Jim J. Orr** has been appointed assistant director of engineering for the **United States Rubber Company.** . . . **Joy Manufacturing Company** of Pittsburgh has announced the appointment of **William Hanson, Jr.,** as manager of conveyor products at the new Philadelphia plant. . . . **John L. Drogas** has joined the sales department of the **Weldaloy Products Company,** Van Dyke, Mich. . . . **Harry O'Bannon Bellinger** has assumed the dual title of director of public works and city engineer for Columbia, S. C.

Dr. Baron

Joseph C. Weaver, president of **Spencer, White & Prentis, Inc.,** Detroit, Mich., has announced the appointment of **Howard R. Gould** as a vice president of the firm with offices in New York City. . . . **L. E. Easley** has been named manager of the construction division of **W. H. Edwards Engineering Corporation,** Indianapolis, Ind. . . . **Robert J. Prowse,** formerly assistant bridge engineer of the New Hampshire Department of Public Works and Highways, has joined the staff of **D. B. Steinman,** consulting engineer. . . . The **Garrett Corporation,** Los Angeles, Calif., has announced the promotion of **Harry H. Wetzel, Jr.,** as assistant to the president. . . . **John A. Holbrook** has been appointed administrative engineer of the **Presbyterian-St. Luke's Hospital,** Chicago, Ill. . . . **Arthur N. Paul,** formerly associate professor of mechanical engineering at the University of Kansas, has been appointed director of technical personnel of **Stromberg-Carlson,** a division of **General Dynamics Corporation,** according to **A. H. Bergeson,** vice president of engineering. . . . The appointment of **John J. Jungbauer** as division engineer for reinforced plastics has been announced by the **Minnesota Mining & Manufacturing Company.** . . . **O. J. Skawden** has been named vice president of **Sutton Engineering Company,** and will continue as chief engineer of the firm's Bellefonte, Pa., plant.

Mr. Prowse

Grenfell A. Swim has been elected vice president in charge of sales, engineering and production of **The Gamewell Company,** Newton Upper Falls, Mass. . . . **Dr. Robert O. Fehr** has been appointed manager of the **General Electric Company's** Mechanical Engineering Laboratory, one of the four major units of the company's General Engineering Laboratory. . . . **Irving Halpern** is the newly appointed supervisor of research and development for **Enterprise Engine & Machinery Company,** San Francisco, Calif. . . . **Robert G. Werden** has been named North Atlantic District Manager of the **York Corporation,** York, Pa., with offices in New York City. . . . **Carl W. Magnuson** and **Townsend B. Smith,** both engineers, have joined **Nekoosa-Edwards Paper Company,** Port Edwards, Wis., according to a recent announcement by **C. H. Reese,** vice president of manufacturing. . . . **Loewy-Hydropress Division** of **Baldwin-Lima-Hamilton** announces the appointment of **Edward L. Hradesky** as sales coordinator for the Guided Missiles Program. . . . **Theodore Gupton** has been named district manager at Houston, Texas, of **Alco Products, Inc.** . . . **Herbert A. Fox** has been promoted to director of the future planning division of the **L.O.F. Glass Fibers Company** with headquarters at the new research center in Waterville, Ohio. . . . **James W. Rigley** has been appointed sales engineer in the products division of **Greer Hydraulics, Inc.,** Jamaica, N. Y.

Mr. Werden

Contracts Awarded . . . **Greenhut & Taffel,** New York City, N. Y., have been awarded a contract for a $30,000,000 slum clearance housing project by the Housing Authority of Union City, N. J. . . . Valley Hospital Corporation have awarded a $500,000 contract to **Davis & Ferguson,** Van Nuys, Calif., for the design of alterations and additions to a general hospital. . . . **Gustave M. Goldsmith,** consulting engineer, Cincinnati, Ohio, has been awarded a contract for $25,000 by **Howard E. Deters,** Kenwood, Ohio, to design a one-story car wash building. . . . The PHA of Kansas City, Mo., has retained the firm of **Tanner and Mitchell, Inc.,** Kansas City, Mo., to design a 250 unit, low rent housing project. The contract is for $3,500,000. . . . **R. Marvin Shipman,** consulting engineers, San Antonio, Texas, have been awarded the structural contract for a high school plant in Victoria, Texas. The contract was for $1,700,000 and awarded by **P. G. Silber,** architect. . . . **Fairchild Engine and Airplane Corporation,** Hagerstown, Md., has announced receipt of approximately $90,000,000 in new orders. These orders bring the Fairchild backlog to substantially more than $200,000,000. . . . Three Latin American projects involving four and three-quarters million dollars have recently been acquired by **Rader and Associates,** Miami, Fla.

Merger . . . The management consulting firm of **Hoff and Bertalott** has been merged with **D. C. Latella & Associates,** Philadelphia, Pa.

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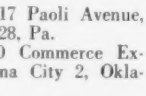

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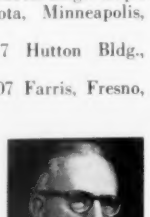

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WIRE FABRIC REINFORCING — Use of welded wire fabric reinforcement in concrete pavements is the subject of a technical bulletin the American Road Builders Association is now distributing. The bulletin elaborates on the use of welded wire fabric reinforcement by discussing 15 basic design considerations, documented with charts, photographs, and formulae. Write Wire Reinforcement Institute, Department 217, National Press Building, Washington 4, D. C.

—AE—

OVERHEAD CRANES — A complete line of underhung overhead cranes with a broad range of applications is illustrated and described in this informative, easy-to-use catalog. Types of cranes featured include push type flexible bridge and standard, hand-geared, and various modifications of motor-driven types which meet all standard requirements. Top and side view line drawings with dimension identification are given for each model followed by complete dimension tables including I-beam, hanger and wheel load data. The Underhung Type Overhead Crane catalog is designated as Bulletin U-200-1 and copies will be sent promptly upon request to Chicago Tramrail Corporation, 1330 South Kostner Ave., Chicago 23, Ill.

—AE—

SOLENOID VALVES — A new 32-page condensed valve catalog, No. 201, is available from the Automatic Switch Company of Orange, New Jersey. It contains engineering information, flow charts, operation and construction details, illustrations, prices, etc. At a glance, from a unique selection chart, the reader can choose a solenoid valve to suit his requirements. For a copy of the ASCO Condensed Valve Catalog, No. 201, write to the manufacturer.

—AE—

LOCKS — Kwikset has announced the availability of its new catalog describing the "400" line locksets and accessories in both the new Bel Air and Standard designs. Technical information regarding all locksets and trim fixtures is included in the new catalog, as well as descriptions of installation aids. For further information contact Kwikset Sales & Service Co., Anaheim, Calif.

—AE—

PROCESS HEATING — A new 16-page catalog by Jensen Specialties, Inc. explains the latest techniques used in modern process heating, including a highly successful method of combining radiation with convection. In 16 pages, the booklet, called "A Modern Advance Approach to Process Heating" covers in detail, applications of booster ovens and complete systems, including information on panel segments, wiring channels and conveyors. A series of photo-stories show these parts in a variety of applications. For your copy of this easy-to-file booklet, write Jensen Specialties, Inc., 9331 Freeland Avenue, Detroit 28, Michigan.

SWITCHES — Several types of Stromberg-Carlson electromechanical switches, originally designed and built for service in telephone systems, now being made for industrial applications, are covered in two new publications. The switches include two general types—automatic stepping switches, and key switches for manual operation. Principal among the stepping switches is the XY Universal Switch, a two-motion, 100-point step-by-step switch deriving its name from the fact that it operates over 10 points in a primary direction, and 10 points in a second direction. Similar but smaller is the XY Deca Switch, providing 10-point selection among 10 four-wire circuits. Among the key switches are a wide variety of cam key, indicating, plunger, push and twist button types, with locking and interlocking features if desired. Suitable mountings for single or multiple key arrangements of any type also are available. Additional information may be obtained from E. R. Sears, Sr., Manager—Industrial Sales, Telephone Division, Stromberg-Carlson Company, Rochester 3, N. Y. Bulletin T5001 gives specifications and features of the Stromberg-Carlson Stepping Switches, and Bulletin T5002 describes key switches.

—AE—

WIRE AND CABLE — Two new publications, one on interlocked armor cable and one on aerial cable, are available from General Electric Wire and Cable Department, Bridgeport, Conn. Publications 19-555, "Interlocked Armor Cable," covers interlocked armor cable that is designed specifically for primary and secondary feeders in industrial power distribution systems and for generator leads, station auxiliaries, and station control cables in electric power stations. Publication 19-266, "Aerial Cable," gives complete data on aerial cables of all types—preassembled, preassembled reverse-lay, field assembled and messenger and ring type—as well as discussion on the application of aerial cable and when to use aluminum conductors. Also included are comparative costs of aerial versus open wire installations and other related tables. Requests by name and number from GE, Bridgeport, Connecticut.

—AE—

WATER TREATMENT — Graver Water Conditioning Co., 216 West 14th Street, New York 11, N. Y. has available two reprints of technical papers. Technical Reprint T-140, a 24-page, profusely illustrated article on all the phases of demineralizing, discusses in detail the advantages and disadvantages of this process for today's power plants. The paper considers some of the developments, trends and applications of both multi-bed and mixed-bed ion exchange and uses several case histories as examples. Technical Reprint, T-138, on the important operating factors and the selection of chemical treatment for water clarification, discusses the theoretical chemical problems of coagulation and goes into the actual physical consideration of the process.

MEASURING EQUIPMENT — Eighty different devices are covered in a 40-page "testing-instruments reference book" just published by General Electric's Instrument Department. Titled the "Measurement Equipment Catalog," GEC-1016, the publication contains complete product information including applications, sources of additional information and pictures. Ranging from simple thickness gages to the mass spectrometer leak detector, there are instruments for research, production, laboratories and educational use. Measurement categories include color, leak detection, insulation, and radiation monitoring. The Catalog is available from the General Electric Co., Schenectady 5, N. Y.

—AE—

WASTE TREATMENT — A low-cost "package" unit for removal of solids from waste water by settling is covered in a bulletin issued by CHAIN Belt Company. Rex Verti-Flo, the bulletin points out, is a self-contained package unit in a steel tank. Ease of installation and operation are featured. Verti-Flo is designed to fit the needs of industries faced with the problem of plant water clarification, process water reclamation, valuable materials reclamation, or antipollution. Write to CHAIN Belt Company, Dept. PR, Milwaukee 1, Wis., for a copy of Bulletin No. 315-92 on "Packaged Industrial Waste Treatment".

—AE—

CONDENSER — Niagara Blower Company Bulletin No. 129R, Aero Vapor Condenser, 2 pages, contains diagrams and photographs, showing new apparatus for condensing vapors independent of a large supply of cooling water. Illustrated are units cooling reflux liquids and condensing vapors at top of distillation towers. Available from the Niagara Blower Company, 405 Lexington Ave., New York 17, N. Y.

—AE—

UNDERDRIVE PRESSES — A 32-page illustrated catalog recently published by Danly Machine Specialties, Inc. shows the company's line of single-, double- and triple-action underdrive presses, ranging in capacity from 400-ton to 2000-ton. These presses are specifically intended for the volume production of large stampings: automobile and major appliance body sections, sinks, tanks and cylinders, and similar large pieces. Catalog illustrations provide close-ups and detailed views of special design and construction features. For copies of the Danly Underdrive Press Catalog, write to: Danly Machine Specialties, Inc., 2100 South Laramie Avenue, Chicago 50, Illinois.

—AE—

INDEX TABLES — Ferguson Machine & Tool Company's new 24-page Catalog 301 gives load ratings and dimensions of more than 150 standard high speed "Intermittor" Index Tables. Ferguson Machine & Tool Co., S. K. Georgieff, P. O. Box 5841, St. Louis 21, Mo.

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims.

Wiley

(*Continued from page* 14)

A third point which we tend to overlook is that an enormous number of talented youngsters who could probably make excellent engineers, cease all educational efforts after they graduate from high school. Thus, the Commission on Human Resources and Advanced Training indicated that scarcely more than half of the top graduates from high school go to college, and of those who enter college more than half drop out before graduation. When we apply these figures to the boys and girls in high school who have potential qualities necessary for service as engineers and scientists, we note that eight out of ten drop out and never graduate. They probably become good citizens, but they could make an infinitely larger contribution to the technical demands of our age if they were to continue.

Just why do they drop out of school? Lack of finances certainly is an important reason, but there are undoubtedly a good many other reasons as well which we had better examine quickly, and then take remedial action.

Still another phase of the problem is that we don't pay enough attention to preventing drop-outs from schools of engineering. I would like to cite just a few figures from the schools of my own state.

My readers are aware that I have the honor to represent a state with as proud an engineering background as virtually any other in the country. Four of her schools of engineering and technology are so outstanding as to be listed by the U. S. Office of Education among 216 American schools which, granted first degrees in engineering to 22,589 graduates last year. Unofficial figures for this June's graduations step that figure up to 30,000.

Nearly 60 per cent of Wisconsin's engineers are graduated from our great University of Wisconsin at Madison. About 30 per cent come from our privately-endowed and world renowned Marquette University at Milwaukee. Two other schools with graduates listed by the U. S. Office of Education are the fine Milwaukee School of Engineering and the Wisconsin Institute of Technology at Platteville.

Our Badger graduates may be found in top spots throughout our country and the world. Their contributions in all phases of engineering are impressive, and it doesn't take an admitted Wisconsin booster to hail that fact. But here are the enrollment facts to consider. In 1955, the total enrollment of the four Wisconsin engineering schools, to which I have referred, was 5,712. That represented an encouraging gain over their enrollment of 4,431 in the fall of 1953. Each year's enrollment was around 2.6 per cent of that of all engineering schools in the country, which, in 1955, had advanced to 22,488.

In 1953, Wisconsin schools graduated 569 engineers, or nearly 2.4 per cent of the nation's graduate class of that year. In 1955, the new engineers from Wisconsin's four colleges numbered 430. Somehow, during four years of college about 150 students dropped out. What happened to cause the drop in potential graduates? Obviously, this is not simply a Wisconsin problem; the factors responsible for the drop-outs undoubtedly prevail throughout our nation.

Still another phase is the fact that our U. S. distribution of engineers is not proportionate to the needs in all of your profession's major and growing categories. Again, let me cite the facts in my own state: Nearly 60 per cent of Wisconsin's talent is enrolled in electrical and mechanical engineering phases. As important as these specialities are, there results to some degree an apparent and relative under-emphasis of such vital fields as aeronautical engineering, architectural engineering, agricultural, geophysical engineering, and engineering physics.

But in the light of recent dramatic developments in, say, aeronautics and the uses of nuclear energy, (many of which are reflected in the growing industries of my own state) it would appear to a layman that some of these latter, rather under-stressed phases of engineering might well be given increased attention in our able engineering schools. Of course, ours is and must remain a free system—with universal, individual free choice and initiative, but we dare not ignore national, yes, international needs, as well. Observing the engineering profession, I have been pleased to note the increasing amount of civic participation by your members in all phases of American life. We truly need the type of cool, factual, objective thinking which our engineers can bring to bear upon local, state, and national problems—on everything from local commercial rezoning to the awesome problems of the shrunken world of the jet age.

It is a fact, however, that our engineers are still underrepresented in many high councils of our government. Look at the membership of the U. S. Congress, or of your own state legislature, or of your city council, and ask yourself how large a proportion of the members are engineers, as compared, say, with lawyers or members of the other professions. The answer is, of course, very few, too few. That is why the engineer's greater role is essential in all segments of American life. An increasing role on the part of engineers in their own technical and professional societies is likewise necessary. Through these organizations, engineers are better able to achieve that which they could not possibly attain individually, for their profession and for their nation.

Similarly, the sound registration of engineers throughout the 48 states of the Union is a most welcome step in the engineering profession's history in our country.

We may expect ever higher standards to be established in this profession. And naturally, to the extent that engineers strengthen their own role in America, they strengthen America itself.

In conclusion, as I wrote at the start, danger signals are to be found everywhere—at home and abroad. But so are signals of opportunity, of promise, of hope—if we but use our God-given intelligence and energy. We as a nation will not fail in this historic hour. With God's help, we will help usher mankind into a new era of fulfillment—of peace and prosperity and freedom.—***End.***

The Author . . .

Sen. Wiley

Alexander Wiley was born in Chippewa Falls, Wisconsin. He was educated in Augsburg College and the University of Michigan, and received a degree in law from the University of Wisconsin in 1907. In his biographical sketch in the Congressional Directory, Sen. Wiley lists himself as a "small-town banker, businessman, lawyer, and operator of a dairy farm." He served as a school board member, president of the chamber of commerce, and governor of the Wisconsin-Upper Michigan District of Kiwanis. His public service career began in 1909 when he was district attorney for Chippewa County. His Senatorial service began in 1938. Since then he has been twice re-elected to the Senate, and has held a number of positions as U.S. delegate to conferences involving foreign relations. He was chairman of the Senate Foreign Relations Committee, 1953-54, and is the ranking Republican member of the Senate Judiciary Committee.

Ault

(*Continued from page* 21)

the actual extent of the individual's success in attaining professionalism. The initiative must come from the individual, but management must furnish a suitable climate. The employer's policies can retard or advance professionalism."

The *Criteria* is woven about four basic principles stated by the Subcommittee as follows:

1. The only satisfactory method of dealing with engineer-employer relationships is on a cooperative common-interest basis.

2. The engineer shares an equal responsibility with the employer in elevating his professional status.

3. Management should regard the engineer as one who is identified with the "management team," whether the engineer is in a supervisory or non-supervisory position.

4. The engineer must be "company minded" and think in terms of the company's problems and growth, as well as his own.

The authors of the *Criteria* concluded their introductory remarks by stating their hope that it will plot a course by which engineers and their employers may cooperate in the fullest professional sense.

To achieve this hope it is necessary that the document be read and studied not only by management personnel, but also by the NSPE members and other professional engineers. To help in this process members of NSPE are invited to use the coupon below to secure their copy of the *Criteria*. It is our hope that each member receiving a copy will discuss it with his fellow professional engineers, and his associates in industry, and that it will also serve as a basis for constructive study and discussion at chapter and state professional meetings.

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Write or send application on Standard Form 57, which can be obtained at your Post Office, to Personnel Officer, Civil Aeronautics Administration, Technical Development Center, P. O. Box 5767, Indianapolis, Indiana.

Crane

(*Continued from page* 27)

and its resultant maladjustments or in peace of mind despite external tribulations.

Engineers are always more effective when they understand the principles underlying the processes with which they work. Human engineering would be incomplete without stating the principles of its physical, mental *and* spiritual components. Professional effectiveness rests solidly upon utilizing these principles both internally and in external activities.

It seems fitting to close with a prayer:

"Father, help us appreciate the unity, the power, and the glory of Thy system throughout the universe.

Help us to understand the unity and the power of Thy laws, in nature, in science, and in human behavior,

Help us to sense and to fulfill the responsibility which we have, each of us, to Thee and Thy people,

Help us to use properly the privilege which we have in prayer, this privilege of coming before Thee in the temple of our minds, to ask Thy forgiveness for our selfish sins and shortcomings, to ask Thine aid in cleansing and rebuilding ourselves physically, mentally, and spiritually, and to ask Thy guidance and Thine inspiration each day as we undertake our chosen services and seek attunement with Thy will and Thy wisdom."

—*End.*

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Ernest F. Goodner, president of American Gilsonite Company of Salt Lake City, Utah, which perfected the process of converting the unique, solid, hydrocarbon mineral "Gilsonite"® into high purity, electrolytic coke for the aluminum industry and high octane gasoline, outlined the pioneering aspects of the first, large-scale, privately financed project in the world to produce conventional petroleum products from a raw material other than crude oil.

The project involves a new processing plant to be completed in the spring of 1957 and the laying of one of the world's largest pipelines for transporting a solid material to link up the mines of Utah with the new refinery near Grand Junction, Colorado. In addition, the plant includes several unique processing features. It is believed to be the first coking plant to perform the complete coking operation at a single site, for it will both *produce and calcine* the coke. The plant is one of the larger delayed coking units in the country.

The name delayed coker is derived from the fact that the plant is designed to delay the formation of coke until it reaches the coke drums. This is a kind of thermal cracking: i.e., cracking the Gilsonite into its light raw gasoline component, and its heavy coke component.

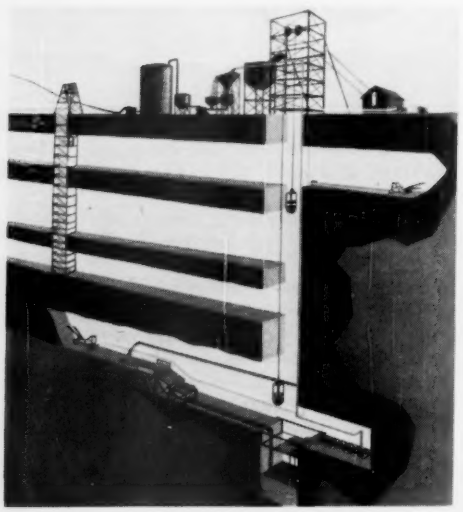
The Gilsonite will be delivered to the refinery in water by means of a 70-mile pipeline starting at Bonanza, Utah and ending at Gilsonite, Colorado. Before the Gilsonite can be fed to the delayed coking unit, it must be separated from the pipeline water. This is accomplished by injecting a small amount of oil into the pipeline upstream from its discharge point at the refinery. Gilsonite has an affinity for oil which causes the small particles to agglomerate and, since Gilsonite is hydrophobic, it can be separated from the water by straightforward filtering or centrifuging operations.

Part of the dewatered material is delivered to a stockpile which will be maintained at approximately 20,000 tons as a reserve to be used for plant feed whenever necessary. The balance of the dewatered material which has arrived via the pipeline will be delivered to a melting tank where it will be heated to approximately 450°F, well above its melting point, by means of heat supplied from hot recycle oil produced in the delayed coker. Other recycle streams in addition to the stream being used to melt the Gilsonite are returned to the process in combination with the melted Gilsonite.

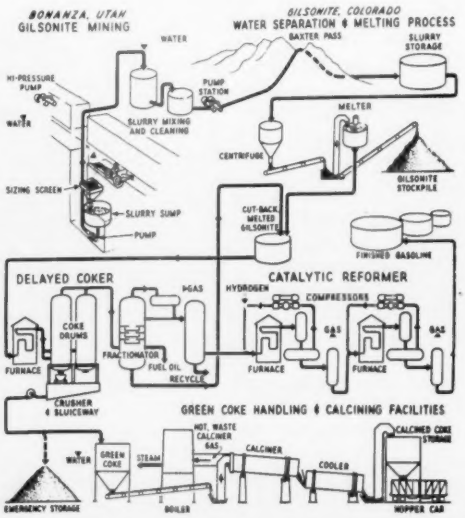
The combined feed to the plant, consisting of 7,700 barrels of recycle and 3,850 barrels of melted Gilsonite—11,550 barrels per day—is pumped into a direct fired horizontal updraft heater operating at 910°F. The output from this heater discharges into a coke drum. Here, the liquid separates from the vapor, coke is formed and precipitates out of the liquid. Coke is continually forming and when the coke reaches a level within a predetermined distance from the top of the coke drum, the drum is taken off stream and the outlet from the direct fired heater is switched into a clean drum and the coking process continues.

In hydraulic decoking, a high pressure stream of water (2,200 psi) cuts the coke out of the coke drums. The high pressure jetting apparatus is suspended from derricks mounted on top of the coke drums. These are similar to oil derricks and are nearly 200 feet high—about the height of a 16-story building. The jets are moved up and down through the coke drums to cut out the coke.

The mixture of water and coke flows through the bottom opening into a car containing a crushing mechanism which breaks the larger lumps of coke down into pieces approximately three inches in cross section. These pieces, plus coke fines and water, fall into a sluice and then to a specially designed pump which moves them to a decanting tank. During the coke removing operation, this decanter tank is closed at the



◄ **Cross-section of a Gilsonite vein showing how the new hydraulic methods, developed by American Gilsonite Company, will be applied. A vertical shaft is first sunk, and slightly sloping drifts are cut at right angles to it. The cut ore is washed to the bottom of the shaft and raised to the surface in buckets.**



► **Flow diagram showing the Gilsonite coking project.**

bottom and the water and fines overflow into a clarifier. The fines collecting in the center portion of the clarifier are pumped into the decanter during the drainage operation. The water is reused for the next operation.

The formation of the coke in the drum consumes part of the output from the heater. The remaining part, consisting of vapors and gas, passes through the drum and into the fractionator. Here various vapors are separated and condensed to form liquids. Some become the recycle streams. One liquid, a gas oil fraction, is withdrawn and charged to a thermal cracking heater furnace. In this heater, the charge is heated to, and held at, a cracking temperature of 985° F. After cracking, both the temperature and pressure are reduced and the vapor-liquid mixture reenters the fractionating column where it is separated into gas, gasoline, recycle stock and cracked tar. This tar contains coke-forming fractions which are part of the overall coke production when recycled through the delayed coking section. Therefore, the only products from the fractionator are gas and gasoline.

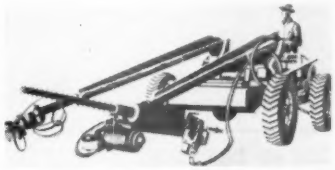
This vapor mixture of gas and gasoline flows from the fractionator as a top-of-column product, is condensed and/or cooled and flows to a low-pressure separator where it separates into wet gas and unstabilized gasoline. A portion of the gasoline is returned to the column as reflux for top-of-column temperature control. The wet gas is compressed, the gasoline is pumped from the separator and these two intermediate products are mixed, cooled and enter the high pressure separator (115 psi) where the gas and unstabilized gasoline are separated. The gas flows to an absorber where a lean absorption oil fraction from the fractionator absorbs any desired low-boiling fractions. The effluent gas from the absorber flows to the plant gas fuel system. The rich absorption oil flows back to the fractionator where the light fractions are vaporized and recycled to the separating-absorption-stabilization system.

The unstabilized gasoline is pumped from the high-pressure separator, is preheated by heat exchange and then passed into the stabilizer, where hot stabilized gasoline of predetermined vapor pressure is produced.

This end product flows through heat exchange, is cooled and moves to temporary storage for final processing.

The calciner is the fourth plant in the refinery. In this plant, water, volatile and combustible materials are removed from the green coke. Green coke is cured by driving these materials out by heat. This is done in a sloping rotating kiln 10 feet in diameter and 180 feet long. As the kiln turns at about one revolution per minute, the green coke is fed into the upper end and slowly gravitates to the lower end. By the time the coke reaches the end, the moisture, volatile and combustible materials have been removed by heat.

Hydraulic jet cutter, developed by American Gilsonite Company, is used on those veins that occur with slight cracks. Powerful streams of water (2200 psi) issuing from the nozzles tear the ore apart.



Specially developed mechanical cutter uses a long, spiked rotary drill. Streams of water issue from the tips along the drill so that the ore is constantly kept wet, minimizing explosion hazards.

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What's New

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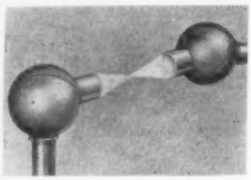
ELECTRONIC EYE FOR INDUSTRY — Item 1



With Hancock Standardized Electronic-Eye Systems it is possible to "feel"—with only a light beam—position, movement, texture, size, quantity, color, and many other qualities under applications where objects and materials must be watched and controlled—but not touched. Features spherical-shaped housings for the electronic "eye" and for the light source. Completely self-contained, the only wires out are to the power source and to controlled circuit. Each sphere mounts directly on the conduit which carries its electrical leads.

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AVIATION OIL — Item 2

Gulf Oil Corporation announces a newly perfected detergent aviation oil for use in all types of aircraft engines. Its use is suitable for both horizontally opposed and radial engines. The new product is a blend of oils containing Gulf's processed stocks to which has been added an anti-foam agent and a detergent dispersant effective for both high and low temperature operation. The new formulation will be made available in three popular viscosity grades.

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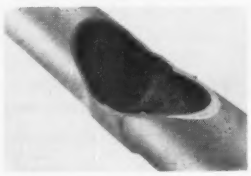
DRAINAGE PIPE OF NEW MATERIAL — Item 3



Chem-Weld, a drainage pipe of a drastically new material, is being introduced by Southwestern Plastic Pipe Company. Reportedly it is strong, durable, lightweight, unaffected by most acids and alkalies and is not subject to rust or electrolytic corrosion. Completely root-proof, water tight joints are quickly made by a chemical cement that is said to bring about a fusion of the pipe to the fitting. Standard lengths of 10 feet, with 20 or 30 foot lengths available on order, cut laying time.

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LOW CAPACITY PALLET LOADER — Item 4

Lamson Corporation announces an entirely new low capacity, fully automatic pallet loader, designed to meet low production needs. The Model "G" loader has a capacity of about 20 cartons a minute and can be justified at a capacity as low as 5 per minute. Handles pallets up to 48″ x 48″ with a maximum load width including overhang of 52″ and maximum length of 50″. Can be loaded with pallets one at a time or in stacks.

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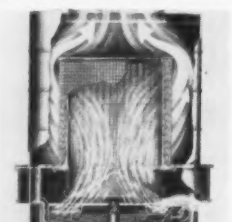
OIL BATH AIR FILTER — Item 5



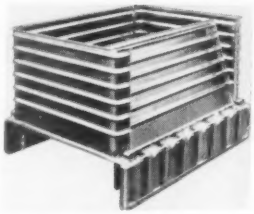
A new oil bath air filter which combines high efficiency with extremely low pressure loss has been announced by the Air-Maze Corporation. The new LPD achieves low-pressure-drop operation without any moving parts or any outside energy supply. Makes economical oil bath filtration available for use with a much broader range of compressors, blowers and engines.

This column describes new products of general interest to professional engineers. For further information, fill in the coupon provided and mail to the AMERICAN ENGINEER.

These listings are informational and are not an endorsement of the products, nor of the manufacturer's claims.

SPACE-SAVING FOLDING BOX — Item 6

A new "fold-away" materials handling box which can be reduced to 1/5 of its original size has been developed by the Pressed Steel Division of Republic Steel. Made of corrugated steel with collapsible sides which are easily set up or folded down. Sides are locked by a pin and slide bolt. The unit can be tiered when loaded, unloaded or folded. It has no removable parts.



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FOR CONCEALED FLASHING — Item 7

The Delta Company has a new copperclad concealed flashing. In 1, 2, and 3 ounce weights, made of heavy crepe kraft bonded with asphalt to electrolytic deposited pure copper, it is said to result in lower flashing costs in all types of buildings for foundation dampcoursing, membrane waterproofing, flashing parapet walls, doors, windows and sills; flashing roof and sidewall junctures, spandrel beam waterproofing, shower stalls, and as a termite shield.

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WARNING LIGHT — Item 8

Big Flash is a weather and dust proof warning light, capable of continuously flashing intermittent warning signals for 1600 hours—approximately 2 months usage—on one dry-cell battery. Its distinctive 5" x 5" square plastic lens (red or amber) has 360° visibility and provides a total of 86 square inches of lens surface. Principal features include: a trouble-free, patented, positive-action cycler-mechanism which assures dependability.

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TEMPERATURE INDICATING LIQUIDS — Item 9

Tempil° Corporation announces an improved line of TEMPILAQ° temperature indicating liquids with greatly reduced settling characteristics—the result of a long study of the effect of particle size on performance. Sixty-two different Tempilaqs° are available, ranging in temperature rating from 113°F to 2000°F. With a few exceptions (true solutions) Tempilaqs° consist of suspensions of temperature-sensitive materials in volatile vehicles, the rate of settling-out varying with the composition.

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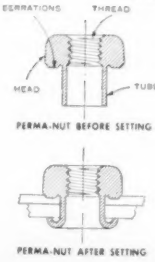
RIVET AND NUT — Item 10

A new type of fastener called PERMA-NUT combines the permanence of a rivet with the disassembly features of a nut. Already in use by several electrical appliance manufacturers, PERMA-NUTS will permanently hold two or more pieces (as a rivet) and fasten others by functioning as a nut. Basically, it is a tubular rivet with a hole in the head tapped with standard threads. Radial serrations on the underside of the head bite into the workpiece, preventing turning, once clinched.



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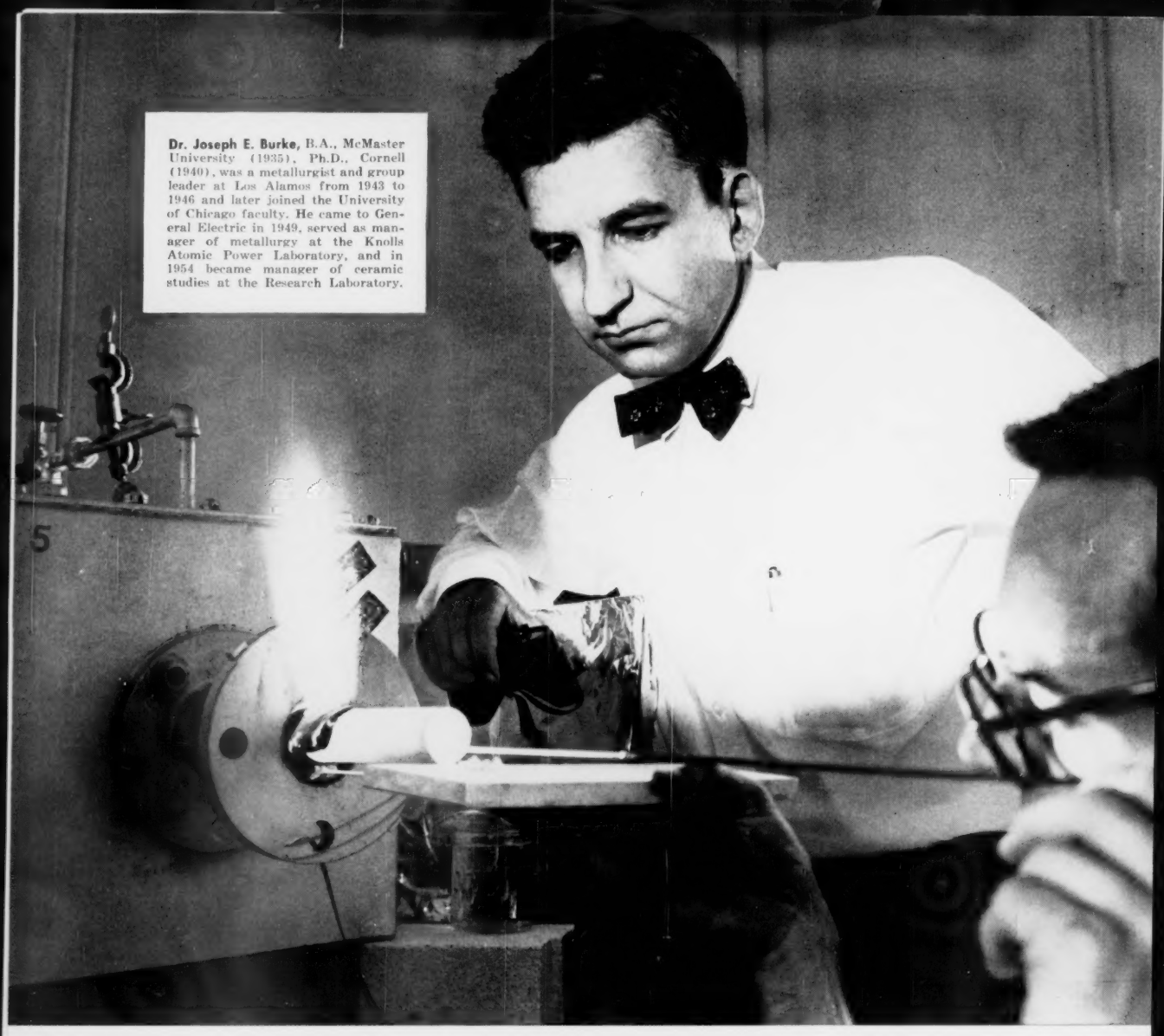

Dr. Joseph E. Burke, B.A., McMaster University (1935), Ph.D., Cornell (1940), was a metallurgist and group leader at Los Alamos from 1943 to 1946 and later joined the University of Chicago faculty. He came to General Electric in 1949, served as manager of metallurgy at the Knolls Atomic Power Laboratory, and in 1954 became manager of ceramic studies at the Research Laboratory.

Ceramics for the jet age

General Electric's Dr. J. E. Burke seeks better ceramic materials by studying their microscopic structure

During a decade as a "practicing metallurgist," Dr. Joseph Burke contributed to the knowledge of structure and kinetics in metals. He also developed an interest in the crystalline cousins of metals: ceramics. Recognizing the potential of ceramic materials, Joe Burke turned his talents toward increasing and exchanging the mutually useful information produced by research in both ceramics and metallurgy. Now he is leading an intensive effort at the General Electric Research Laboratory to learn more about the *structure* of ceramics — and the effects of structure on mechanical, electrical and magnetic properties.

At General Electric, ceramics research already has created unique insulators for vacuum tubes, new ferrites for electronic uses, and transducers whose applications range from hi-fi to ultrasonics. As the day of "non-brittle" ceramics comes ever nearer, Joe Burke and his associates expect their non-metals may be the answer to many high-temperature problems of the jet age.

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